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Good Password Practice

We look at how to choose a secure word or phrase

For anyone who uses the internet, strong passwords are an essential part of daily life. It doesn't matter how little time you're online, you're likely to find yourself entering, creating, resetting or remembering a password. The sheer number we're called on to create can make it inconvenient to ensure that each new one is more difficult to crack than the last, not least because you have to also remember it.

The reality of the situation is that many of us use weak passwords or have just a single strong password that we reuse over and over, weakening its overall effectiveness. For obvious reasons, neither of those things is a good idea. Luckily, current good password practice can help you come up with a better system for creating and remembering password. And we're here to show you how.

Strong Password Basics

Conventional wisdom holds that the strongest passwords contain a selection of numbers, upper and lower case letters, and even punctuation, with a length of around 8-14 characters. But what's the logic there?

The criteria these passwords are trying to fulfil are simple: they need to be unguessable, and they need to be nearly impossible to reach through simple enumeration (trying every combination of letters and numbers) or by dictionary attacks (using a wordlist of standard passwords). A strong password makes enumeration too inefficient to use and dictionary attacks useless because the password isn't a common enough string to be found in a wordlist.

To explain how this works, we'll start by imagining that your password is particularly short – just three letters

long. Not because that's a good idea (it really isn't), but because the numbers make a little more sense at this end of the scale.

If you use an existing word, such as 'cat' or 'pin' or 'log', it would be relatively easy for someone to crack the password. There are only around a thousand three-letter words in the English language, so it would take no more than 1,000 guesses to crack any three-letter password that appears in the dictionary. This could potentially be accomplished in minutes by a decent attacker.

So what happens if we now assume that the password isn't limited to words in the dictionary? This means any letter can be one of 26, so the total number of potential passwords is 17,576 ($26 \times 26 \times 26$). Quite clearly, this is 17 times harder to guess than a three-letter word, but even that only



GOOD PASSWORD PRACTISE

912,673 potential passwords, a four-letter password gives you 88,529,281 (88.5 million) and a five-letter password give you 8,587,340,257 (8.5 billion) potential combinations. And most systems demand at least eight letters, which would take years for a single computer to enumerate – assuming the attack already knows that your password is eight letters long. Effectively, it's uncrackable.

A More Memorable Password

But the problem with strong passwords is that they're hard to remember. A gibberish mix of punctuation and letters is hard to crack, but it's also hard for your brain to get a grip on as well. Sure, you can go through the password recovery process if you lose access, but that's inconvenient and engineers users to prefer simpler passwords. Typing a complex password correctly once can be hard enough.

The alternative is to come up with a passphrase instead of a password. Passphrases are lengthy combinations of words that mean something to you, but which would be indistinguishable from gibberish to a computer making an attack on a password system. Famous quotes or opening lines mixed with punctuation and numbers give you a long password that's easy to remember but hard for a computer to crack.

For examples, you might choose something like '15MenOnADeadMan'sChest' or 'StarTrek:TheNextGeneration1701D'. These passwords are long and complex enough to be effectively uncrackable, but they're also simple to remember because they have meaning to humans. In computational terms they're scarcely any easier for a computer to crack than a password like 'ml2wxljZ!U{UdDkQ[J9U#g1A' would be, but they're an order of magnitude easier to remember. The only problem you're likely to encounter is that some sites won't let you have passwords that long (in which case you should choose a shorter phrase).

Of course, that only solves one problem: how to remember a difficult password. What about the next problem: remembering ten, 15 or 20 difficult passwords so you're never using the same one twice?

Avoiding Re-Use

The only way to keep your password truly secure is to use a different one on every system you access. That way, if a shopping website or forum you use gets hacked and your password is stolen, you'll know it's useless for any other site. But short of writing them all down or storing them in a secure system, how are you supposed to remember enough passwords to never duplicate them?

The best way to do it is to create an algorithm. This means you don't have to remember the password at all; you simply remember the algorithm and that allows you to essentially construct your password the same way every time.

To give a practical example, imagine you use the passphrase '99RedBalloons!'. The more places you use it, the greater the chance it'll be cracked or intercepted, so the less secure every account you use is. But if you modify the password for every site – perhaps by adding both the number of letters in the domain and the last two letters of the domain to the end of your password – it becomes unique to every site.

In this circumstance, your Facebook password would become '99RedBalloons!8ok' and your Amazon password would become '99RedBelloons!6on'. If someone cracks one password, they won't be able to use it on any other site, but because you know the algorithm to create the password, you only need to remember the basic elements and fill in the gaps each time.

Final Advice

If nothing else, the most important thing is that you don't use the same password for your email account anywhere else. If someone gets into your email account, they can potentially gain access to any site you use by changing the password through the account recovery process. Above all, keep your email password unique and unguessable to anyone but you.

Of course, there's a chance even the best passwords can be cracked somehow, and even if they're not, a loophole could allow someone to access your account another way. Remaining vigilant at all times is the only way to keep your data completely safe. Having the right passwords is just the first part of that process! **mm**

raises the time an attack would take to succeed into the order of hours.

Luckily, it can be harder still. Adding case-changes into your password helps makes each letter twice as hard to guess, which increases the security exponentially. If any letter can be upper or lower case, there are 52 potential characters each one could be, meaning an attacker would have to try up to 140,608 combinations (52 x 52 x 52) to get your password. 140 times harder to guess than a three-letter dictionary word.

Numbers add another tens options and punctuation another 35 (or thereabouts). If you mix numbers, upper and lower case letters and punctuation, each character can be one of 95 potentials, meaning the total number of potential passwords is 912,673 – almost a thousand times harder to find than a dictionary word.

At this point, we can show you why password length matters, because under those conditions, if a three-letter password gives you up to

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Secure Device Guide

Keep your data locked away from others but accessible to you

Compared to the storage media of the past there's almost nothing to hate about flash drives, bar the fact that they're easy to lose. Whether left on a train, dropped in the street or slipped from your pocket by an opportunistic thief, an errant USB key can cause considerable stress – not least because of the idea that someone else might be rifling through data that you intended to keep private.

Whether you're worried about identity theft or working on something important that absolutely can't get into the wrong hands, secure storage solutions allow you to transport your data from place to place without having to worry about what might happen if it gets lost. Although many devices are aimed at enterprise organisations with money to burn, there are several consumer-level solutions that offer similar types of protection. Here's our guide to the best of them.

Kingston Technology DataTraveler Locker+ G3

Don't let its mouthful of a name put you off, because the Kingston Technology DataTraveler Locker+ G3 is a decent entry-level piece of security storage hardware for anyone concerned about security. Its big selling point is its 256-bit AES hardware encryption, which prevents all unauthorised access using a password-protection software system. Even if someone tried to access the flash storage on a component level to circumvent the safety features, they'd get nothing but gibberish out.

The password system is built into the drive's decryption software, but it requires no special drivers or installation. This does mean that the storage only works with Windows and Mac, because those are the only operating systems capable of running the software it contains. While you might be able to get it to work on Linux, be

warned that it's not going to be compatible with most non-standard systems, such as games consoles or set-top boxes.

Should the drive be stolen, the software will wipe the storage contents after ten invalid logins, which is nowhere near enough time to perform a brute-force attack. Even if this happens, you don't have to lose your data, because an automatic USBtoCloud backup service provided by ClevX can ensure there's an online copy of the drive's contents so you can access or restore them in the event of a disaster.

Physically, the drive is also built for security. It has a durable metal casing to protect it from exterior damage, and a built-in key lock allows you to secure it in transit. The USB plug is also covered by a cap, which connects to the rear of the drive for safe-keeping. A five-year warranty is designed to offer peace of mind, and





“ Secure storage solutions allow you to transport your data from place to place without having to worry ”

purchase of the drive also entitles you to free technical support. It's a USB 3.0 drive, so it's not just secure, it's fast, too.

Price-wise, it's also incredibly reasonable given the high-grade protection on offer. The 8GB version is available for £12, the 16GB version is £15, the 32GB is £26, and the largest 64GB version is £52. If you're thinking of buying one, that makes the 16GB version the best value, but the 32GB arguably has the best balance between price and capacity, even though it's no better than the 64GB version.

Corsair Flash Padlock 2

Available in 8GB, 16GB and 32GB capacities, the Corsair Flash Padlock 2 USB drive also uses 256-bit AES hardware encryption to protect your data, but with a major difference: it features a hardware keypad so you can lock and unlock it without having to run any software. This feature alone makes it compatible with any system that supports a USB drive.

To access the contents of the device, you simply enter the hardware code (user-customisable as a four- to ten-digit code),

and once the code has been correctly entered, the data remains accessible until the key is removed from the system it was placed into. Hacking detection features will lock the key completely for two minutes for every five failed attempts, which – along with the inconvenience of entering a hardware code lots of times – essentially makes brute-forcing too inefficient to succeed.

The cheapest model (the 8GB) costs £20, with the 16GB model slightly more expensive at £30 and the 32GB at £39. This makes the 32GB version the most attractive by far, based on price, but the 8GB version isn't unreasonably expensive; there's only an £8 difference between it and the DataTraveler.

Despite a slightly higher price than the Kingston device, the Corsair Flash Padlock 2 has a shorter warranty (three years rather than five) and only supports USB 2.0 transfer speeds, but that shouldn't be much of a turn-off at capacities this small. The majority of the price increase comes as a result of the hardware keypad, but this feature is significantly more versatile than the software alternative employed by the DataTraveler, so you're getting something for your money. The body is also rubberised, which gives it shock-resistant protection, but it's slightly inconvenient that the cap doesn't store easily anywhere, so there's a small chance you could lose it.

Despite this, the stronger protection and greater versatility on offer make the Corsair Flash Padlock a good mid-level choice for secure storage, and while its previous-generation transfer speeds make it a little inconvenient for high-capacity storage, it's not so slow as to be completely unusable. Especially worth trying if you're not planning to use it exclusively in Windows and Mac systems.

iStorage Datashur

Like its primary rival, the Corsair Flash Padlock, the iStorage Datashur combines 256-bit hardware encryption and a keypad-based access code to ensure that no one but you will be able to get at your drive's contents. The on-board keypad means that even a keylogger won't stand a chance of stealing your passcode, and the unit's military-grade encryption means that without it, the data is meaningless.

Again, the encryption is performed in hardware so there's no need for additional drivers or software. It's compatible with virtually any operating system: just plug it in, enter the keycode, and your data





becomes accessible as if on any normal USB key. Remove it from the USB port, and it locks instantly. Unlike the Flash Padlock, the Datashur offers tiered PIN codes with different rights levels, so 'users' are limited to read-only access, while full access can be restricted to those with an admin-level code.

Built-in anti-hack protection means the drive will instantly wipe itself if the PIN is entered incorrectly ten times in a row, providing protection from brute-force techniques. The approach to data security actually extends beyond mere digital intrusion, with a water-resistant and shock-proof aluminium casing designed to shield the unit from the elements. Should you lose or forget the PIN, a drive reset can render it usable again, but it will also clear the contents to prevent unauthorised recovery.

The drive supports USB 3.0, so you get full-speed data transfers out of all models, and the price includes a three-year warranty. The downside is that it's incredibly expensive compared to even other secure USB keys: the 4GB model costs £40, the 8GB costs £60, the 16GB costs £81 and the 32GB a full £100. That does make the 32GB version the best value, but in terms of relative cost it's hard to recommend any of them unless you're interested in the multi-user feature, which is unique to this drive.

Imation IronKey H300

If you want greater-capacity storage available to you at affordable prices,

then IronKey's range is the place to look. Although the range includes enterprise-level devices with built-in biometric locks, we're going to modestly assume that the average Micro Mart reader is most likely to be interested in the IronKey H300 Basic model, which comes in 500GB or 1TB capacities with a USB 3.0 interface.

The hardware-based encryption comes in the form of 256-bit AES XTS protection with a hardware-based password and a tamper-resistant aluminium enclosure. It's compatible with Windows and Mac OS X and comes with a five-year warranty. Not that you should need it, because IronKey drives are built with high-quality components specifically chosen to resist wear with age.

Whereas most encrypted drives store their access credentials on the drive itself, the IronKey range includes a proprietary 'Cryptochip', which stores user credentials and encryption keys in a completely secure manner. One of the benefits of this is that a properly authorised device can reset the password without erasing the data. The enterprise versions of the hardware even include cloud-based or on-premises management, so you can administer multiple drives from a single remote or local system using specially bundled software.

The 500GB model of the IronKey H300 is nice and affordable at just £150, but it's the 1TB model that truly impresses, available for just £25 more. £175 for a terabyte of encrypted storage is great value, and the software management of this model makes it perfect for beginners who haven't tried using encrypted storage before. If you want a good all-rounder, balancing cost, capacity,

Make Your Own Secure Storage

Although it's hard to build a USB drive with the same hardware encryption features as some of the hardware featured in this guide, that doesn't mean that encrypted storage is completely out of reach. A combination of a standard USB key and a file-encryption program can create storage that's as functionally secure, if not as outright functional as anything with hardware encryption.

Although for years the standard tool for drive encryption was TrueCrypt, the software was dramatically removed from development, with its developer abruptly claiming that it had lost interest in the software. Despite that, some organisations argue that TrueCrypt 7.1a, the last stable release, is still a safe choice for encryption. (Note that version 7.2 exists but is designed to help you migrate to another encryption package).

There's no consensus for a TrueCrypt successor, but VeraCrypt is a fork of the (open-source) software, which is achieving some prominence. VeraCrypt fixes many bugs found in TrueCrypt but isn't fully compatible with its volumes due to the modifications. It also hasn't undergone the auditing process that made TrueCrypt so popular, so there's no guarantee that it's secure other than the developer's word.

It's also possible that your operating system has encryption features built in. If you're using Windows 8.1, then you might have access to a Device Encryption option, but this is limited to new installations and only on certain hardware. Windows 8 and 8.1 Professional versions include BitLocker encryption, as does Windows 7 Ultimate.

Regardless of what software you choose to employ, you can use any of these to encrypt the contents of a USB drive and effectively create secure storage. It won't work on any non-Windows system, and it won't have the military-grade self-destruct features and hardware-encryption features that make encrypted storage so attractive. But if you want to prevent your files getting looked at by amateur snoopers, this type of solution is both effective and affordable.

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speed and portability, this might just be the best device for you.

iStorage DiskAshur

Offering many of the same features as the iStorage DataShur, the iStorage DiskAshur takes the hugely secure USB key to the next level of capacity, with terabyte-level storage available. These external USB drives require no additional power source other than the built-in USB connection and contain the same hardware keypad as the DataShur USB keys, albeit in a larger form. The same features – tiered access and anti-hacking procedures – are also included. Once again the encryption is performed in hardware, and even though it's a mechanical drive, the extra protection doesn't slow down access at all.

Additional features unique to this drive include a self-destruct password, so you can instantly wipe the data on a drive, and a full reset password, which wipes all of the data and access codes so the hardware is essentially back in factory condition. The keypad is wear-resistant, so there's no likelihood of worn numbers alerting anyone to the code currently in use, and the case has omni-directional anti-shock mountings and rubberised exterior to prevent data loss from knocks and falls.

Notably, the DiskAshur is available with two levels of encryption. Models with 128-bit encryption are generally cheaper and functionally no less secure (at least for the immediate future), but then models with 256-bit encryption aren't unreasonably more expensive once you've decided to shell out this much for a secure drive.

The smallest version of the drive is a 250GB version costing £128, while pricing snakes upwards towards the 2TB version, which costs more than twice that amount, at £290. As you can tell from that pricing, the cheapest versions are the worst value, and we think the best balance between price and capacity is found around the 500GB model, which costs £150-£160 depending on the level on encryption you choose.

Again, the DiskAshur is considerably more expensive than a standard unencrypted drive, but its hardware encryption features mean you can use it in any device and be sure that your data remains secure. It's fast, powerful, and not too expensive, which makes it great for anyone looking for high-capacity secure storage. [mm](#)





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Attacks & Vulnerabilities: Understanding Computer Security

James Hunt imparts some essential information about malware

There are many ways that your computer can be attacked, and part of stopping yourself from becoming a victim of malicious or fraudulent activity is knowing how your computer might be targeted, what might be targeting you and why they might be doing it. Although it's common to hear terms like malware, spoofing, phishing and more, it's not always clear what they mean or why they're a problem. Hopefully with this article we can change that for you.

Malware

Perhaps the most frustrating security issue affecting modern computer users is malware. Short for 'malicious software', the term covers any program deliberately designed to interrupt normal computer operation. Viruses, trojans, worms, keyloggers, spyware, ransomware, adware: they can all be placed under the umbrella term of malware, because they're programs that have purely negative effects for the system they're installed on.

The strategies and techniques malware employs are hugely varied. At the least problematic end of the spectrum are programs simply designed to vex or irritate a user. At the opposite end you might find software that tries to directly steal your credit card details for fraudulent purposes. And between those you get programs that try less direct attacks: adware that redirects your searches or displays pop-up ads

to earn referral fees, or keyloggers that attempt to steal your personal data it can be sold in bulk to spammers. Some programs don't target you at all and instead co-opt your system resources into a botnet so it's part of a wider attack against another system. The programs may hide in the background so you don't notice them at all or appear up front so you have no choice but to engage with them.

The sheer amount of malware in the wild makes it the single biggest threat to computer users. Anti-virus programs, anti-malware suites and firewalls are all needed to prevent the installation of malware on a system and help remove malware when it gets installed. Most malware uses a combination of exploits and social engineering to get installed without the user realising, whether that means employing a malicious website script to run software without user permission or ambiguous phrasing on a dialogue box so the user inadvertently agrees to install it.

The quantity and complexity of malware means that the only way to prevent a computer from ever getting any is to not connect it to the internet and never use any removable media, which is obviously impractical. Installing the relevant countermeasures is essential, and learning to spot the signs of a malware infection – unusually slow operation, strange browser behaviour and unexplained processes – is essential. Alternative



operating systems such as Linux are far less vulnerable to malware and may also be worth considering if you want more protection than an anti-virus program alone can provide.

Spoofing

The word 'spoof' means to forge or imitate, and that's exactly what this sort of attack does. Whether by stealing credentials or broadcasting fake information, a spoof attack tries to trick a system into thinking the attacker is something it isn't.

Perhaps the most popular form of spoofing is phishing (pronounced 'fishing'), in which an attack website gives the impression of being an official outlet – perhaps for an email provider or bank. By copying a site's design and/or imitating the site's URL, phishing websites steal your personal data by trying to make it seem as though

you're entering it into an official site. The most sophisticated of these websites may even redirect you to the actual site after you're done, so you won't even notice they've stolen your details!

Common phishing targets include eBay, PayPal and online banking systems – anything that involves access to money. You're usually sent an email or message that claims your account has been disabled or breached, and that entering your login details is the way to unlock it.

An even more sophisticated version of phishing is called 'pharming' (pronounced 'farming'), which involves editing your system's hosts file (or otherwise intercepting DNS requests) so even valid attempts to visit a website redirect you to a fake server.

Other types of spoof attack may involve an attacker cloning your MAC address so a network thinks you're connected to it or stealing an active session ID by monitoring your traffic so a server believes you're still accessing the site even after you've left it.

In all cases, the best way to avoid spoofing attacks is to be

vigilant. Log out of websites manually so session IDs expire instantly and become useless, ensure that networks are protected by more than just MAC filtering, and don't trust emails and websites that try to get you to reveal personal information so they can 'help' you recover an account. Resetting a password will never require you to input more than one or two pieces of information for verification purposes, and if you're told that your account has been locked for security reasons, then try to speak to a human at the company in question to make sure it's true before you attempt any unlock process.

Social Engineering

An interesting quality of security breaches over the last decade and a half is that the delivery vectors haven't really become any more sophisticated. Attacks still rely on the same combination of minor rights exploits, filetype obfuscation attempts and drive-by tactics that were spreading viruses as far back as the late 90s. The difference between modern security threats



and those of the past is that today, they don't attempt to trick the system; they attempt to trick the person using it.

The rise in prominence of ransomware is a good example of how social engineering has been a success for hackers. Rather than relying on a mechanical search for credit card details, like early viruses might have, or employing a discreet keylogger to hide on your system and wait for the information it needs, ransomware throws itself in the user's face, saying 'pay now or your data will be gone forever', playing on fears and anxieties to extract your money.

Any attack that targets the human element of a system instead of the computer itself is said to use 'social engineering'. This can mean anything from a malicious website pop-up trying to trick you into revealing your passwords 'for security reasons' to sending you a letter in the post asking you to complete a survey with personal details. Social engineering abuses people's trust to get the information attackers need.

It's popular, because while systems can be instantly reconfigured to blacklist websites, block filetypes and filter out emails, it can take years to educate people once a threat becomes common. The sheer scale and apparent success of the Microsoft Tech Support Phonecall scam is a good example of that: rather than exploiting a security hole that could be closed in seconds once a fix was found, the scam works by tricking people into manually installing malware for the attackers, and years after it was first revealed it

“ The rise in prominence of ransomware is a good example of how social engineering has been a success for hackers ”



continues to succeed often enough that the scam hasn't yet died out.

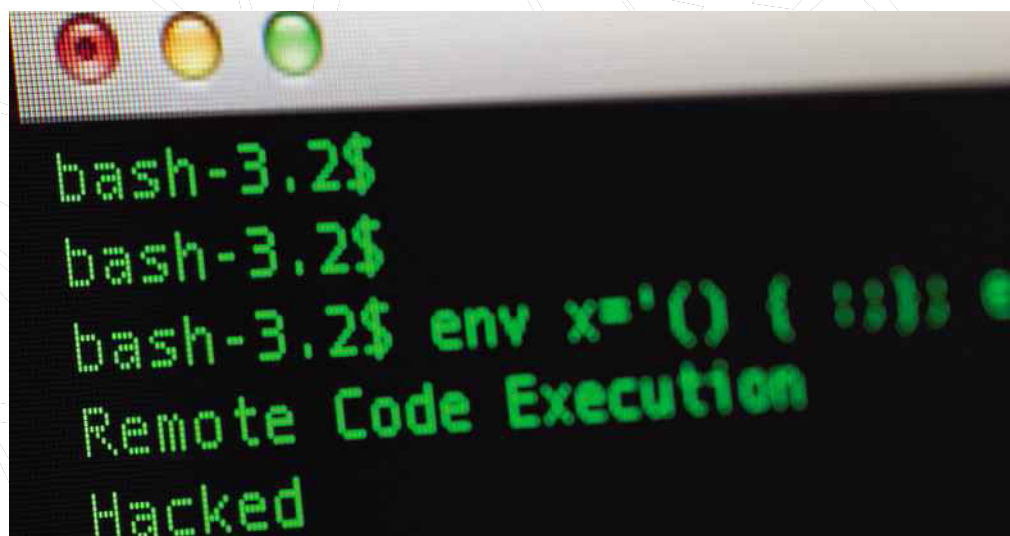
On one level, the increasing reliance on social engineering might actually be cause for celebration. If computer security has become so effective that it's now less effort to manipulate people than software, then that means we're only one step away from some huge victories. To stop social engineering from working, all we have to do is educate people about it and make it as difficult to exploit users as it is to exploit their machines.

Easier said than done, perhaps, but at least it's a goal that feels achievable. It's unlikely malware will ever completely go away, but between more secure systems and better-educated users, progress is definitely being made.

Exploits

Although it's not the only way to install malware, a considerable amount of malicious programs attempt to enter a user's system without them realising. And while there are several techniques that allow this to happen, the most common way is through an 'exploit'.

As the name suggests, exploits use opportunistic techniques to install software on the target system. Normally, this is a security hole such as a memory overrun or a credentials leak, which allows a script or program to execute code that would otherwise be prohibited. This code can then install the software as if it had received



permission from the user to do so. It may not be as direct as this, but once the initial incursion into a system has been made, it becomes simpler for programs to elevate their permissions to the point where malware can be installed.

Due to their unintentional nature, when an exploit is discovered in a piece of software, it tends to be repaired quickly. This is why updating software is crucial to maintaining security. Exploits are occasionally brought to developer's attention by 'white hat' hackers, who find them before they're employed by malware creators, but it's more common for an exploit to only be noticed once a piece of malware that uses it is released into the wild. Exploits that have just been discovered and not yet patched are known as '0-day' exploits and are highly prized by

hackers, because they're difficult to protect against.

Although the process of locating and repairing exploits is well out of most users' hands, it's possible to reduce the effectiveness of exploits by keeping software up to date. You may wish to enable automatic updates to programs that support the feature or employ a program like SuMo, Secunia PSI or FileHippo Update Manager to find instances where your software is out of date. The only way to prevent exploits being used is to ensure that they're unavailable when hackers try to employ them, and keeping your software current is the best way to do that.

Denial Of Service Attacks

As the name suggests, a denial-of-service attack is an attempt to make a site or service unavailable to its users through malicious means. The most common way this is achieved is by 'flooding' the target with huge amounts of requests and traffic so it becomes unable to respond normally. In the worst cases, the overload may even force the server to go down completely.

It's possible to launch a denial-of-service attack against a single computer, but they're more frequently aimed at large organisations and employ zombie computers and botnets to launch the attack. A zombie computer is a system – normally an ordinary home PC – which has been infected with malware that allows remote control of its functions, normally without any other negative effects. During a DOS attack, the system



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can be instructed to send requests and traffic to the target site automatically.

Although one zombie PC isn't necessarily much of a problem for even a small server, when hundreds or even thousands are linked together, the traffic can quickly become overwhelming. When this many zombie PCs are instructed to act in unison, the result is called a 'botnet'. Botnets are hard to block because the traffic comes from hundreds of sources, which have the appearance of completely normal systems. You may sometimes see DOS attacked referred to as 'DDOS attacks', where the extra D at the start means 'distributed', as in 'distributed across many systems' – although other forms are now so uncommon that it can usually be taken as read that any attack is a distributed one.

Even though individuals are rarely the target of denial-of-service attacks, the way they co-opt regular systems means it's important to maintain your system's integrity to ensure you don't become part of a botnet. If nothing else, it could open your system to further breaches and result in you being banned by your ISP and/or the

target website due to a failure to control your system properly.

Spam

Many of the threats in this article are mercifully uncommon on a day-to-day basis, but spam is something we deal with on something like an hour-to-hour basis. If you use a good mail client, most of it will be filtered away – but no mail client has a 100% success rate.

Although spam itself is usually more of an irritant than a danger, it isn't universally so. While the days of spam being used to deliver malicious code are more or less behind us thanks to improved mail servers and detection techniques, the majority of adverts delivered by spam are still connected to legally dubious activity and should be entirely ignored.

Even opening a spam email remains a bad idea, because it may use the same tracking techniques as legitimate marketers to see whether you read the emails. If you do, your address is marked as active, and the mailer is more likely to resell it to other spammers. This is why it's a good idea to delete any spam emails unread: the more you look at, the more you get and the

greater chance you have of being fooled in some way.

Like DOS attacks, one of the bigger problems with spam isn't necessarily being on the receiving end: it's that your PC might end up sending it instead. Spammers use botnets to avoid having their communications blocked by mail servers looking for high quantities of spam from individual servers, so if your PC has been co-opted by a botnet, you might find that you're one of the people sending the spam you hate to receive, which can again result in negative sanctions from your ISP or email provider.

Dealing with spam is simple: ignore it, delete it, and trust the judgement of any filter that marks mail as malicious. Reducing the amount of spam you get is difficult, but you can keep a tighter rein on it by making sure your email address is kept private. If you post it in forums or leave it public in blog posts, web-crawlers will find it and sell it to spammers. You'll always get some amount of spam, if only through spammers who simply guess at addresses, but the less free you are with your contact details, the lower your chances of becoming a target for spammers. [mm](#)



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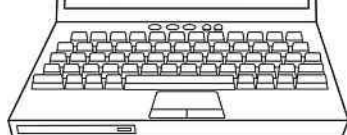


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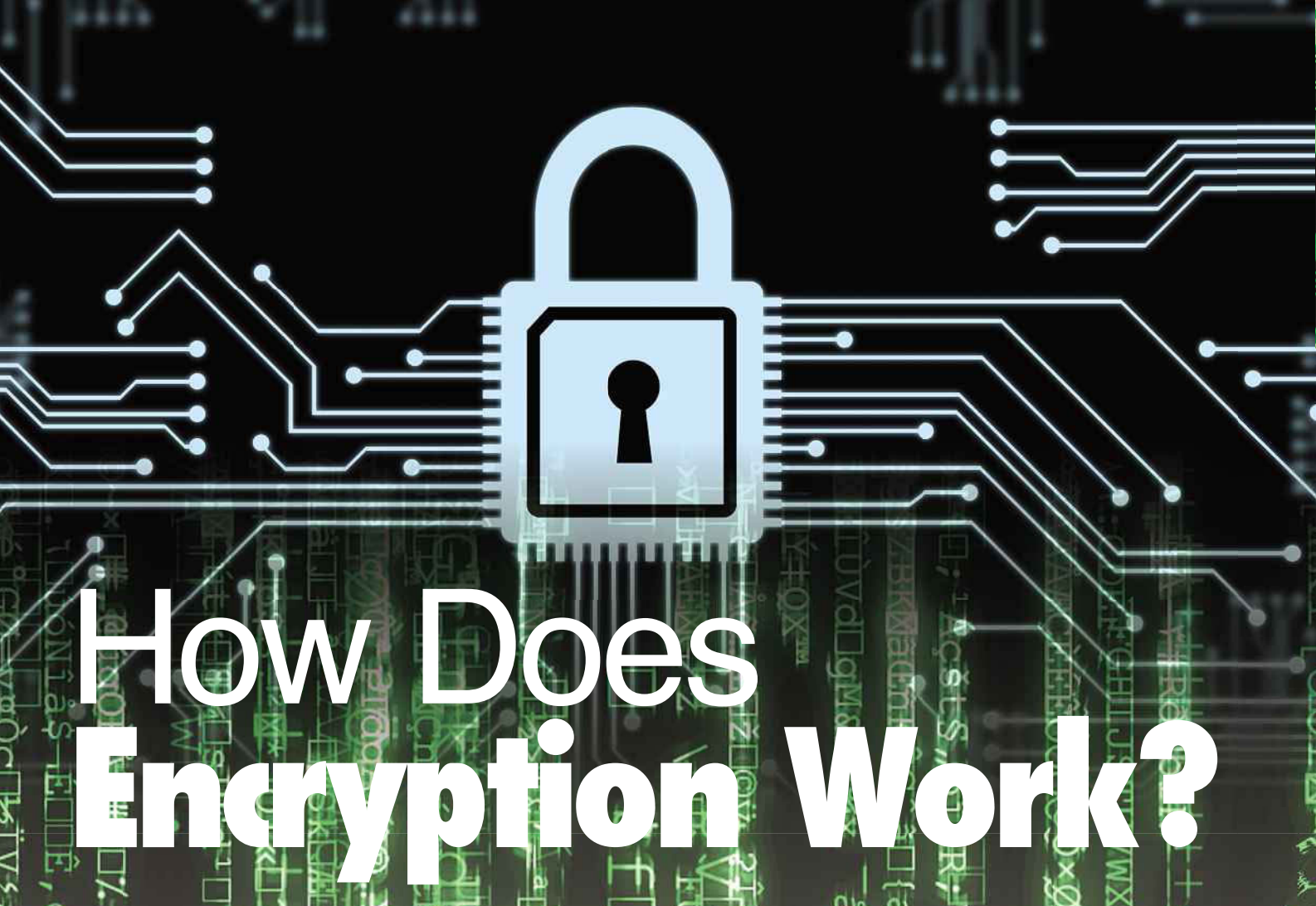
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How Does Encryption Work?

We look at how this vital security technology actually functions

Recently, the Prime Minister, David Cameron, suggested that it was not acceptable for private communications to be rendered inaccessible by intelligence agencies as a result of encryption technology. Whether or not you agree with this point of view, it does raise a question: what is it that makes encryption so powerful? How does it work, and why is it so successful that even intelligence agencies are unable to break it?

For a start, it's worth pointing out that encryption isn't only used by people who are trying to evade detection. Every time you send a credit card number over the internet or log into your bank account, make a call over Skype or send a message using Whatsapp, you're using encryption so powerful that it could take hundreds of years to crack it through brute force processing alone. If you ever see a padlock icon appear on your browser – which should be regularly – you're using encryption.

The reason for this is simple: privacy. If the information wasn't encrypted, anyone would be able to yank it out of the digital ether and reuse it. That might not be especially alarming if it's just your chat about the latest TV show, but if you're sending payment details or passwords, it

becomes a lot more desirable to keep the information secret. And just because MI5 wouldn't be interested, it doesn't mean you want the information available to everyone!

Public Key Encryption

Most current encryption is based on a technology called 'public key encryption', which was developed by GCHQ in the 70s. Public key encryption is based on a mathematical reality that it's more difficult to break a number down into its original factors than it is to multiply those factors to get the result. If you use large prime numbers as the basis for a key, it's easy to multiply them together but performing the process in reverse would require the computer to try thousands of combinations.

Essentially, public key encryption generates a large number using factors known only by the original creator. The number is then published (hence 'public' key) and used to encrypt a message using verified secure algorithms. The public key is, essentially, a digital safe. You can steal the safe, but you can't get at its contents without either knowing the combination or trying all of them in order until you hit on the right one – something which would be excessively time consuming. To get at the

contents of the safe, you need the original factors that were used to generate the public key.

The larger a number is, the more difficult it becomes to find the original factors (because there are more potentially valid combinations, which must be enumerated and dismissed), so the strength of a key is measured by the number of bits it contains. Every new bit makes it exponentially stronger, so although a 40-bit key (once common) can now be cracked by a standard home PC in a reasonable amount of time, a 256-bit key would take thousands of years to crack even if we diverted every computer on the planet towards the task. And it's not uncommon for keys to be 512-bit, 2048-bit or 2048-bit!

So while any key can be broken given the time and resources, it's effectively impossible to crack even 128-bit encryption whether you're a home user or a supercomputer-wielding intelligence agency.

At this point, you may wonder why, if 128-bit encryption is so hard to beat, we have higher tiers at all. Essentially, encryption is designed with failure in mind. If a flaw were uncovered in the underlying algorithm, it would become easier to crack the encryption because fewer operations



would be necessary. For the largest keys in use, even a 99% reduction in the time required to crack it would mean that it was still effectively impossible to do, and the performance cost of encrypting with bigger keys is so small that there's no reason not to employ them where possible.

It's also worth noting that a long key is one of the few effective defences against the potential of a quantum computer. Although they aren't yet viable in any more than an experimental context, quantum computers would be able to brute-force current public key encrypted messages in feasible timescales, so longer keys are necessary to keep the encryption ahead of best computers.

Symmetric Cryptography

Public key cryptography is said to be asymmetric, because it uses a different key for encryption and decryption. It's also possible to have symmetric encryption, which requires both the sender and recipient to have the same key. The Enigma code would be an example of symmetric cryptography, because it was necessary for the decoder to have the same machine settings as the encoder in order to reverse the encryption.

“ Almost as soon as any form of encryption is created, people will attempt to crack it ”

Symmetric cryptography was the earliest form, and the first major symmetric algorithm developed for computer cryptography was DES (Data Encryption Standard) in the 1970s, which used a 56-bit key. Although there are 70 quadrillion (70,000,000,000,000,000) potential combinations for a 56-bit key, it's now easy to brute force the combination thanks to the speed of modern systems. As a result of this, DES has been replaced by AES (Advanced Encryption Standard) which can use keys 128-, 192- and 256-bits long.

If AES seems like a familiar acronym, it's probably because it's often attached to wireless security. One of the ways WPA2 can be deployed is as WPA2-PSK (AES). Indeed, this method is preferable to earlier standards such as WPA2-TKIP, because it is significantly more secure than the alternatives.

However, one of the problems with symmetric encryption is that two users trying to communicate with one another need to find an existing secure method to exchange the initial key, otherwise the encryption key can be intercepted, rendering the key insecure. Public-key cryptography avoids this by using two different keys so clients can establish a secure connection that can't be usefully intercepted.

SSL & TLS

One of the most popular uses of public-key encryption is in the Secure Sockets Layer (SSL) connection, which was developed by Netscape to enable secure communications over the web. SSL has since been incorporated into a larger standard known as TLS (Transport Layer Security), which applies encryption to all online

communications, rather than on a case-by-case basis like SSL.

Both TLS and SSL use certificate authorities to verify the security of information being sent. The process begins with your browser requesting a web page using the https protocol. The server then sends a public key and certificate, which your browser then verifies in a number of ways, checking that it was issued by a trusted party, that it's currently valid (i.e. not past its expiration date) and that it's coming from the server the certificate claims it is.

When this has been ascertained, your browser then uses the public key it was sent to encrypt a randomly selected symmetric key. It then sends this to the server, which decrypts it (using its private key) and then replies with a message encoded using the symmetric key to show your browser that the connection is ready. At no point can the symmetric key be intercepted, so all future communications are meaningless to eavesdroppers, and even if the initial public key transfer is intercepted, it's only useful for encoding messages, which isn't of any interest to an eavesdropper.

When the transaction is complete, the symmetric key is then discarded, rendering it useless for any further communications – so even if someone was able to crack it, it would be too late to be of any particular use.

Hashing Algorithms

If you're this far into the article, you're probably wondering where keys come from. Simply put, public keys are generated using a hashing algorithm. But what does that actually mean?

Essentially, a hashing algorithm turns an input (be it a message, request or random number) into a unique hash value, which is nearly impossible to convert back into the original message without knowing what the algorithm did to it. The hash value is effectively a 'summary' of the original data.

A simple algorithm might take the input '127' and apply the operation 'multiply input by 57', which would give the output '7239'. Given the output, it'd be almost impossible to arrive back at the input – 127 – without knowing how the algorithm arrived at that value. Public keys use algorithms that are far more complex and give very large hash values, and a 256-bit key has more potential combinations than there are atoms in the universe.

One of the useful things about hashing algorithms is that the keys they generate are fixed in size, so there's no way to guess from the hash how long the original data was. Knowing the exact length of a key's decrypted form would vastly reduce the amount of time it'd take to crack it through brute force methods, so it's helpful that a hashing algorithm obscures this information.

Hashing algorithms can also be employed to create checksums. While the primary purpose of encryption is to ensure that messages can't be intercepted, it's also useful to verify that a message hasn't been damaged or altered since it was initially sent. This can be accomplished through the use of a checksum or CRC (cyclic redundancy check) test.

Checksums are one of the oldest and simplest forms of authentication. By performing a simple operation on the data, you get a value out at the end, which can be appended to the data so the recipient can apply the same test to see if the result matches. If it doesn't, the data has been altered somehow since it was originally sent. Checksums tend to be quite simple, however, which means it's possible to damage or alter a message in such a way that the checksum remains valid.

To account for this, a more complex form of checksum called the cyclic redundancy check was developed. CRCs use polynomial division to determine a CRC value, which is more accurate and gives a better chance of spotting smaller errors – although again, it's not completely immune to tampering.

It's worth noting that all checksums are hashes, but not all hashes make good checksums. The intent of a checksum is to check data integrity (and in some cases it can even help with error correction, as with ISBN-10 numbers.)



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“ Almost as soon as any form of encryption is created, people will attempt to crack it ”

Therefore, it doesn't matter if the checksum for two sets of data returns the same number as long as it's sufficiently unlikely to do so as a result of damage to a dataset. Again, ISBN-10 has just 11 possible check digits, but it would be extremely hard to damage an ISBN-10 code so it returned the same check digit as the correct versions.

By comparison, hashes work best if there's a low probability of any collision in the output, and whereas checksums are small and easy to compute (so there's no delay in checking the integrity of data, hashes are necessarily large and difficult to compute. It's not impossible to use a checksum as a hash value, but the important point is that it may be inefficient to do so.

Breaking Encryption

Almost as soon as any form of encryption is created, people will attempt to crack it. Most systems are designed to resist

brute-forcing (where every potential decryption solution is tested in the hope of finding the correct one), but there are still vulnerabilities that might arise.

The most likely way encryption can be broken is by locating a flaw in the original encryption algorithm or the way the encryption is used.

To return to the example of the Enigma code, one of the first steps towards breaking the code occurred when researchers discovered that no character could be encoded as itself. This might seem like a small detail, but this slightly eliminated some potential settings for Enigma's encryption algorithms, which made brute-forcing more feasible.

After building enough machines that were able to brute-force the Enigma code based on this information, it was then discovered that the Nazis would send an Enigma-encrypted weather report every

morning using the same message format. Knowing this made cracking that day's code easier still, since the code-breakers could start by looking for a specific output, which further narrowed the number of possible combinations that could be in use.

Obviously the Enigma code is considerably more simple than the encryption used on modern computers, but it's a strong illustration of how subtle flaws in the encryption and its deployment can turn an essentially uncrackable code into something that was broken on a daily basis. Both situations could have been avoided, but only in retrospect did it become apparent that they were flaws in the system. The same could apply to current forms of computer encryption.

So concludes our whirlwind tour of encryption and the varied techniques it employs. If you felt under-informed before, we hope you're feeling a bit more enlightened, and if you were particularly hot on the subject, we hope you'll forgive any simplifications made in pursuit of a clear explanation. At the very least, maybe next time you pay for something online or log into your email account, you'll appreciate what it is that's going on under the surface. **mm**

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Understanding Online Security

How are you protected when you're on the web?

Although security is an issue many of us are very concerned about, there are a lot of ways you can make your online life more secure that you may not be aware of. From device-secured password authentication to always-encrypted traffic to file integrity verification, the protocols and software exist to help make everything you do that much less vulnerable to interception and attack. If you're not using at least some of these, then you should be!

Two-Factor Authentication

Sometimes called 'two-step authentication', two-factor authentication is designed to make logging into a secure account more difficult than simply stealing the login credentials. It accomplishes this by requiring an additional step of verification – a second factor – without which the

username and password alone are not sufficient.

Perhaps the most common form of two-factor authentication is your bank card. You need both the physical card and the PIN number to withdraw money from a cashpoint, and without both, the verification process cannot be completed. Secure VPN services often have similar requirements, needing both the correct login credentials and a code generated by a secure hardware token issued beforehand.

Many two-factor processes use a mobile phone as part of their procedure, since it's something that the owner is likely to have access to at all times. When a login process is initiated, the website will check whether the device or location it originates from has been previously authorised, and if it hasn't, it will send a message to the mobile phone (either by

SMS messaging a verification number or contacting an app on the device), which the user must then respond to on the website. If the person trying to log in doesn't have the phone, the second factor of authentication cannot be completed, and the login will fail – even if the username and password is correct!

The only major drawback of this method is that if the user becomes separated from their second-factor device – for example, if a phone is stolen or the battery runs out – then they would have to return to a trusted device to access and administer their account, which may not be convenient. Most systems get around this by providing single-use access codes, which can be used for verification in emergencies, though these must obviously be stored somewhere apart from the second-factor device so they remain accessible as well!

Although two-factor authentication isn't perfect, it is significantly stronger than a single username/password combination at the cost of only a little usability. It also has the advantage of alerting you if someone tries to use your username and password without permission. If you receive a request for authentication that you didn't ask for, you'll know someone tried to enter your username and password in an unauthorised location, and that in itself can act as a warning to change your login details! Not all services support two-factor authentication, but it's highly recommended that you enable it on those that do – particularly your email account.

One-Time Passwords

Similar to two-factor authentication, a one-time password (OTP) is, as the name suggests, a password that is



valid only once. OTPs avoid a number of problems associated with the traditional form of password use and are often deployed alongside two-factor authentication to shore up the security further. It's almost impossible to steal a OTP because once it's been used, it becomes invalid.

Like two-factor authentication, OTPs are often distributed to a phone or other hardware token, though they can also be issued through a web service. Crucially, OTPs can be issued alongside existing passwords to provide an extra means to log into a service if you're worried about your main credentials being stolen or intercepted.

At present, OTPs are most often used to create app-specific passwords for third-party software and devices that may log into sensitive accounts. Rather than risk allowing your username and password to be stolen by an attack on a third-party app or system, services can issue a one-time password to authenticate the device once without the need to disclose the true password. The OTP can only be generated by someone who already has

“ Perhaps the most common form of two-factor authentication is your bank card ”

the correct login credentials available, so it's guaranteed to be secure even if the system it's used on isn't.

The downside of OTPs is that they tend to be long and random, which makes them hard for users to input and remember even for the short periods of time necessary. If the generating algorithm is flawed or stolen, it may also be possible for attackers to develop their own valid OTP.

But if you want additional security, it's worth investigating the use of OTPs. Many services employ them to verify apps on tablets and smartphones. Most notably, Google may require that you use app-specific one-time passwords when linking up your phone and email account. An additional benefit of this is that you can later revoke access, so if your phone is stolen, you can log

in and disable the OTP so the thief is unable to read your emails without you having to change your main password – which is obviously a huge inconvenience!

PGP

A form of encryption designed for personal use, PGP (Pretty Good Privacy) is bound to individuals so recipients can verify and authenticate correspondence. If a PGP signed email is valid, you know it came from the person it purports to have come from, and you can decrypt the key to ensure that the content has not been tampered with.

Although originally free, use of PGP's software now requires a small commercial fee, but it remains the most popular email verification standard, having been in wide use since 1991. The system uses a

public key, which is available to everyone, and a private key known only to a user. When you send a message, you use the recipient's public key, and when they receive it, they use their private key to decrypt it. Sometimes emails include both the encrypted and unencrypted form, so non-PGP users can still read the email, but PGP users can verify the content and sender of the message if they wish.

To use PGP, you have to download and install some PGP software, which can be delivered in the form of a browser plug-in, mail-client extension or stand-alone application. The software should take you through the process of acquiring and registering your public key and dispense a private key for you to use.

Although Symantec currently owns PGP and has discontinued freeware versions, similar non-proprietary versions of the technology exist. OpenPGP is an open-source implementation of PGP, which is available for free and which is natively supported by several existing email services.

As well as being used for authentication, PGP-encrypted



Password:

emails are useful for sending sensitive information, such as passwords or personal information that might be useful for identity theft if intercepted. In an ideal world, all emails would incorporate a form of PGP, which would prevent phishing, mistaken identity, spam masquerading as genuine correspondence and forged emails. Unfortunately, the effort of converting everyone to PGP is rather more than would make this possible, but at least the tool is there for those who want to use it.

MD5

A form of checksum, MD5 (message-digest 5) is a cryptographic hash, which produces a 32-digital hexadecimal string that is effectively unique to the input. The output can therefore be used to verify whether a file has been tampered with or not. The original creator or uploader can supply the MD5sum of a safe copy, and the downloader can test their copy to check that the MD5sum output is the same. If it isn't, the file has been altered in some undisclosed way, and while it isn't necessarily a

problem (the download may simply have not completed properly), it can imply malicious practices. At the very least it's an indication to download it again from another source.

Checking an MD5sum isn't difficult, but most versions of Windows don't provide the tools to do this as standard. Windows users will need to download a tool such as WinMD5 Free (available from www.winmd5.com), which is able to calculate MD5sums and test existing ones against a file.

It's worth noting that while it remains in common use, MD5 has been repeatedly broken, and it's possible for hackers to produce MD5 'collisions', which creates the same output for two different files. Therefore, MD5 should never be the sole test for whether a file is unaltered, but it can be an effective proof that it has been. Many government agencies now require that encryption is tested using the more recent SHA-2 algorithm, but MD5 remains in common use across the internet and is still a valid tool.

Traffic Encryption

Traffic encryption has become a big topic of late,



“ In an ideal world, all emails would incorporate a form of PGP, which would prevent phishing ”

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particularly in the wake of surveillance scandals over the last year or two. Many browsers and companies have switched to using the HTTPS (secure HTTP) standard by default, but some other, more robust protocols exist that you can use to protect your traffic.

Transport Layer Security, sometimes called 'Transport Level Encryption', is a protocol designed to ensure that all communications between online services and their users is encrypted and therefore resistant to tampering and eavesdropping. It is, in effect, a successor to the Secure Sockets Layer (SSL), which allows communications to be secure when sensitive material is being sent, such as credit card details or passwords. The goal of TLS is to ensure that all communications receive the same high level of security.

TLS is composed of two parts: the TLD Record Protocol and the TLS Handshake Protocol. The former provides security for connections but can also be used without encryption, while the latter allows servers

and clients to authenticate one another securely over a connection, establishing which algorithm and cryptographic keys will be used before exchanging any actual data.

Although TLS has not been fully implemented in major browsers, there are alternatives available. TCPcrypt is an extension to the existing TCP network protocol, which is in the experimental stage, but software implementations do exist for most operating systems. The encryption is 'opportunistic', which means if either side doesn't support the TCPcrypt protocol, then it will revert back to regular TCP.

TCPcrypt works using unique session IDs as keys and adds a small 36-byte overhead to each data packet, which is negligible for broadband connections. The performance impact is lower than TLS and SSL because authentication is provided by individual applications, rather than on the transport level. You can download the software to implement TCPcrypt on your system from tcpcrypt.org.

“ There are many web-based VPN companies that charge a small fee ”

VPNs

Along similar lines, it's possible to use a VPN (virtual private network) to encrypt your traffic, which is particularly useful if you're using a public wi-fi connection and want to make sure your data is secure. VPNs create an encrypted 'tunnel' to a trusted third-party server, ensuring your traffic can't be intercepted along the way. That server then handles your requests and serves them back to you over the tunnel.

Although this isn't a fully secure system (the unencrypted traffic might be intercepted after it reaches the VPN server), it does ensure that traffic is difficult to intercept locally and certainly not by simple means.

Setting up a VPN is a relatively simple matter, but the resources involved in running

one mean that it's rarely free. There are many web-based VPN companies that charge a small fee for easy access, but watch out for limitations on things like bandwidth and protocol.

If you feel capable, it's possible to set up your own VPN server using Windows, though you will need to ensure that it's secure – the port it runs on will be open to the internet and therefore vulnerable to hacking, so a strong password is essential, and it's also worth choosing a non-standard port to run it on. Having your own VPN does have other advantages; you'll be able to access your desktop system and local network without being in the house, for example, but so would anyone else who manages to crack your password, so take care! [mm](#)



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10 Security Tips For **Everyday** **Computing**

Simple steps for safer surfing

Maintaining security while you're using your computer isn't a full time job, but it does require full-time vigilance. If you're acting in a way that isn't secure, changing that behaviour can be difficult – especially if you're not aware of it in the first place! To help you improve your computer security, we've compiled this list of things – some you might be aware of, some of which you probably won't be – to help keep your time on the PC and internet as secure as possible.

1

NEVER Write Down a Password

This is rule number one because it is, indeed, rule number one. It's not surprising that some people keep a written log of them but, for reasons that should be obvious, this is a very bad idea. It gives thieves, hackers and snoops a simple way to get access to all of your personal information in one simple step. They just have to open a file on your desktop or snap a picture of your notepad.

Admittedly, to get to that point someone will have already had to breach one level of security by accessing your computer or personal space (either physically or on the internet). That doesn't mean you want to make it easy, though.

Making passwords easier to remember is the way to go (there's a guide elsewhere in this issue about

how to do that), but if you're absolutely incapable of committing passwords to memory, encode them if you must write them down. That way, no one but you will understand them.

A simple encoding method shifts the first digit forward one, the second digit back two, the third digit forward three and so on. So, if your password was 'pass23' you would write the 'p' as 'q' (+1), the 'a' becomes 'y' (-2 and wrapping to the end of the alphabet), the first 's' becomes 'v' (+3) and the second 'o' (-4). The '2'+5=7, and the '3' becomes a '7' if you count back six (2, 1, 0, 9, 8, 7). Thus, the encoded password would be 'qywo77'. You can reverse the process to recover your own password, but if anyone steals it they won't realise what you've done, and the password will be useless.



2

Protect Saved Passwords

Like writing down passwords, saving them in your browser is a way of making life that little bit more convenient. Unfortunately, it comes at a huge cost to your security. If your phone, tablet, laptop or even desktop gets stolen, saved passwords will allow the thief into any number of private accounts from which they could cause a huge amount of damage.

Obviously, the best course of action is to input them every time you want to access a site, but we can understand how that would be both time-consuming and annoying. Indeed, you could argue that it creates a security risk, since a keylogger or shoulder-surfer would be more likely to catch you typing the password in.

If you do choose to save your passwords, it's important that you set a master password so they remain protected even if your device is stolen or otherwise accessed without authorisation. On phones and tablets, this means a password on the lock screen. On desktops, it means going into your browser and enabling the master password setting, which forces you to input the master password before your saved ones become available to use. A minor inconvenience, but one which will improve your security a lot.

3

Keep Your Software Up-To-Date

It doesn't hurt to repeat this: the most important thing you can do regarding security of your system itself is to keep automatic updates enabled, be it on Android, iOS or Windows. Security loopholes are being found all the time, and as soon as they're common knowledge you can bet that someone out there is finding a way to exploit them. Installing the latest updates, then, means the holes are patched either before or quickly after they're discovered, which significantly improves your overall security.

4

Disable The Mic/Cover The Webcam

It might sound paranoid, but it isn't. If you've been following the news you'll know that Samsung's smart TVs were recently found to be broadcasting any speech they picked up to a third party. The official reason given for this is that Samsung uses another company's technology to handle voice recognition tasks, but it does beg questions about what might have happened if someone had found a way to intercept the data, and what they may have been able to hear.

Microphones and webcams don't necessarily watch you by default, but it's relatively trivial (in hacking terms) for someone to install software on your PC that gives them access to them. There are numerous cases of hacked webcams being used to spy on, and even blackmail, people. Who knows what sensitive data you might read out without realising your microphone is relaying it to a malicious entity, be that a hacker or trolls?

Whether you simply unplug this hardware, put a sticking plaster over the unused camera lens or disable the devices in your hardware settings, this is just one way to maintain your personal privacy in the face of a system that could be monitoring more than you realise.





5

Lock Unattended Devices

A good practice to get into is to lock devices when you're not sitting at them. This mostly applies in communal situations (using your computer at work, at school/university or in an internet café, perhaps), but it does also mean making sure your computer can't be accessed by anyone who may have broken into your house while you're not around or wandered into your room during a party.

Locking a device is important for two reasons: it protects your files, and it protects your online behaviour. If you step away from a device and someone else uses it, the authorities and/or owners only have your word that you weren't the one at the PC, should it be used for anything illegal. Even if it's your own system, an unauthorised user might take the opportunity to install malware so they can access your system remotely later on. You don't have to be a spy to have a computer worth protecting, and when it's so easy to do (just press Windows Key + L, for example), it's worth getting into the habit.

6

Keep Backups

A good security plan isn't just about having the mechanisms in place to prevent unauthorised access. It also means having the mechanisms in place to recover from an attack. Malware might infect your programs, ransomware might permanently block access to your files, and in the worst case scenario, malicious users might wipe the contents of your system. Solid backups won't stop any of that from happening, but they'll make the recovery process much easier.

Typically, it's recommended that users make regular backups because it helps them recover from catastrophic data loss, but if you get into

7

the habit it'll also mean you have the ability to recover from an attack on your system in just a few clicks. Lost data can be easily restored, and you'll feel able to wipe your system to get rid of malicious software safe in the knowledge that the important stuff won't be lost at the same time. If your PC or tablet is stolen, you can even use your backups as a guide for checking what accounts might need protecting.

Keeping backups is never a particularly glamorous thing to do, but as far as protecting yourself goes, it's essential. Just remember to keep them on a hard drive or USB key that's out of sight of your main system. The last thing you want is your backup going AWOL too!

Use Your Anti-virus Software

It goes without saying that it's good security practice to have an anti-virus program installed, but how often do you actually use it? Real-time protection is good for stopping the worst instances of viral infections, but what about the other features of your software? Scanning your backups allows you to ensure that their integrity is maintained, and a firewall will block unwanted traffic while you're connected to the internet. Keeping your protection up to date will ensure the latest viruses can't slip through the net, and regular scans will make sure that you haven't accidentally introduced a virus into your system.

Basically, it's not enough to have an anti-virus program installed: you also have to make sure you actually use it. Check your downloads manually, allow it to filter or probe web pages and emails that look suspicious. Trust in its judgement. Most of the time it knows better than you do what's a threat, so let it do the hard work.

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Use A Secure Browser

Internet Explorer has improved its security massively in the last few years, but it's still the slowest entry in a three-horse race. Unless you have accessibility needs or software requirements that can't be met by browsers other than Internet Explorer, you should consider switching to Firefox or Chrome, both of which are vastly superior to Microsoft's flagship – and typically faster and more standards-compliant too!

As for which of the alternatives is best, that's harder to pin down. Chrome is generally regarded as the most secure, due to its high volume of security updates – they come nearly twice as often as most browsers. Firefox is a close second and considerably more secure than Internet Explorer, which receives lots of updates but has low security overall.

Whichever you choose, you can always improve security using plug-ins and tools like Disconnect, Blur, DNSCrypt, and uBlock, which help anonymise your traffic and prevent interception and tracking by third parties.

9

Don't Trust Public Wi-fi

Free wi-fi is great in theory, but in practice you have to be careful that you're actually connecting to the right network. It's a trivial matter for anyone to set up a wi-fi hotspot that anyone can access, and just as trivial to use software that can intercept the traffic, which can lead directly to identity theft, credit card fraud and account hijacking.

This doesn't mean you have to avoid public wi-fi completely, but it does mean taking steps to protect yourself when you do use it. If you're using it in a business or other public establishment, always check with an employee

10

that they have wi-fi and get them to tell you what the network name is. Look for login information. Even free and open hotspots usually ask you to input your details before you use them. A hotspot designed to trap users might not, so if you find yourself able to log in without anyone trying to keep track of you, it's worth being suspicious.

When you are using a hotspot, don't make payments or input your address or personal details, and don't talk about sensitive or secure matters. At the very least, if you have to do these things then considering using a VPN tunnel to encrypt your traffic and make sure it's hidden from the prying eyes of whoever's running the hotspot.

Ultimately, if you're unsure, don't use the network at all. It's a good idea to find out how (and indeed whether) you can run your own hotspot using your mobile phone. It won't be as fast as public wi-fi, but it will be far more secure.

Don't Think You're Immune

Perhaps the most important piece of advice is that no one is immune to attack, no matter how secure you think you are. Even if you're the most cautious computer user you know, there's always going to be a loophole or an exploit out there that you simply can't account for.

Keeping your data and passwords in order will go a long way towards ensuring that if your accounts do get hacked or your hardware does get stolen, you know exactly how to go about protecting yourself before any serious damage occurs. Security breaches are, ultimately, a fact of modern day life, but they only become a real problem if you let yourself think it'll never happen to you, because then you won't be prepared when it does. [mm](#)



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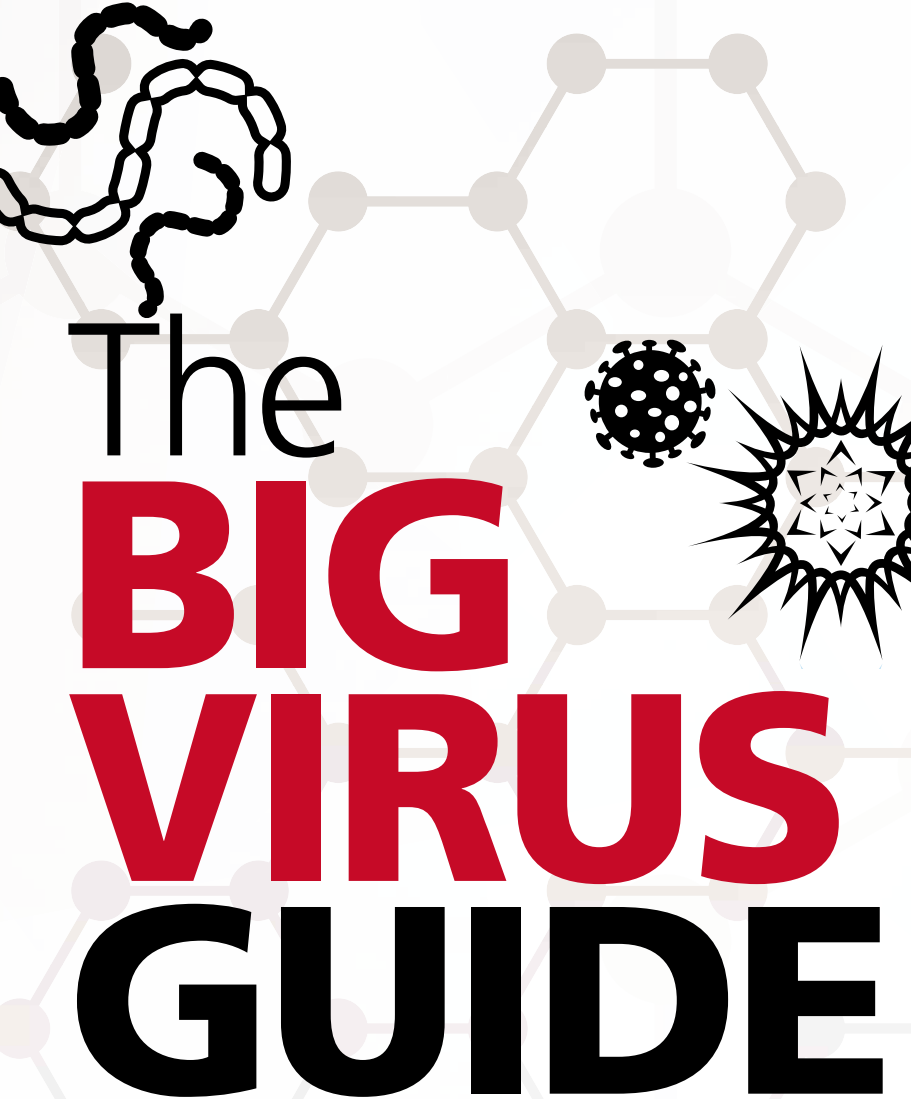
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The **BIG** VIRUS GUIDE

Knowing your enemy is half of the fight

As the internet changes, both in terms of the technology that underpins it and the way in which we use it, so too does the type of viral threat we can expect to encounter. The 'mischief' viruses of the past gave way to commercially motivated adware and spyware, and so too have these been succeeded by ransomware and scareware – programs that rely on social engineering to survive instead of semi-legitimate business.

The sheer number of threats out there means that making sense of them all can be confusing. What's the difference between a virus and worm? What does adware do that scareware doesn't? And how do you even end up infected with these different types of malware? To answer these questions (and hopefully a lot more!), we've put together this guide to the various types of malware you might encounter. As well as explaining what those threats do and where they might come from, we'll also look at what they might look like in the near future – and most

importantly, how you can protect yourself against them.

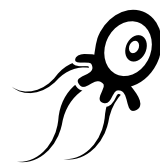
The Past: Viruses, Worms And Trojans

A computer virus is any self-replicating program designed to either damage or impede a system or network, though in some cases this is only by leeching resources rather than by actively attacking it. The worst examples can wreak havoc on a computer by deleting data, preventing access to your files and even rewriting parts of your operating system entirely.

The word 'virus' is often used as a generic term to encompass any malware, including worms and trojans, but it often specifically refers to programs that attach themselves to executable files so they can spread and replicate in a covert manner. Unlike trojans, which don't self-replicate, viruses carry a 'payload' – damaging behaviour that activates under certain conditions, such as on a specific date or if a certain program is run.

Strictly speaking, a worm is a piece of self-replicating code that doesn't require a host program to become active like a virus does. It propagates through unplugged security holes in operating systems and software, and while they're often harmless to individual PCs, they do their damage on a macro level by clogging up networks and servers with massive amounts of unwanted traffic. Worms don't usually carry a payload, but they do actively copy themselves to as many places as possible.

Today, most worms spread themselves using email or social media, contacting the people in your address book or friends list to spread themselves further – something that's both inconvenient and embarrassing for the original sender. While Facebook, Tumblr and Twitter have become much better at preventing social media worms (which use scripts to repost themselves to a user's feed), the likelihood of this style of attack becoming prominent





remains high as long as social media remain popular.

Finally, a trojan is a program that can be hidden in another executable, though unlike viruses, they are not usually self-replicating and tend to be attached to another program deliberately by a malicious user. When a trojan is executed, it delivers its payload, which is usually an attempt to open a 'backdoor' to your PC, allowing hackers unauthorised access to your personal files. Trojans typically stay hidden because they cause no direct damage to your system; as long as they're installed, the backdoor remains open, so they don't want to make it clear that they're there at all.

The difference between these different types of malware is subtle and largely academic in a world where the primary types of threat come in a more sophisticated forms. One quality that viruses, trojans and worms all share is that they tend to be quite simple, small and

parasitic – something that isn't true of most modern malware, not least because the goal of most modern malware isn't to attack and destroy a system, but to harness its resources and steal the information on it.

You can only be infected with a virus, worm or trojan by executing an infected piece of software or using an infected piece of media. Floppy disks used to be the prime suspects, but these days anything from a USB memory key to a rewritable DVD could harbour one. The most likely suspect, though, is your e-mail. When you get a piece of e-mail spam that isn't trying to sell you something, it's a safe bet there's a virus of some kind attached in the hope that you'll carelessly run it. For this reason, many mail clients block attachments of certain kinds altogether.

The best way to stop viruses is by installing an anti-virus program; it'll not only remove existing infections, but can actively prevent known



“ Most worms spread themselves using email or social media ”

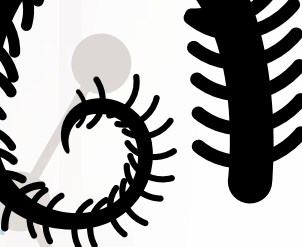
viruses from installing themselves. You can get hold of many different anti-virus applications free, so there really isn't any excuse for not having one. If you're still stuck, then the popular choice remains AVG Free (available at free.avg.com), which will provide plenty of protection, as well as constant virus updates to ward off the newest infections.

Despite their best efforts, anti-virus programs can't always be fully up to date and comprehensive, if only because new viruses have to appear in the wild before they can be analysed and fixed. Users must be constantly vigilant about not running programs from unreliable sources, whether it's an executable attached to a piece of spam, a piece of pirated software or a seemingly harmless joke application. To do so risks infection, and the damage to your system could be immediate.

Malware

Although any malicious software can be called malware, the term usually refers to a set of specifically malicious programs: spyware, adware and ransomware. Like the mutant offspring of simple viruses, malware programs are designed to install themselves on your system and stay there. They don't usually try to replicate themselves across to other systems, but they are likely to





replicate themselves on your system so they can easily restore their infection if one copy gets removed.

Spyware refers to any program that tracks your online activity as an ostensibly secondary function. Examples may include a search engine toolbar which, while purporting to give you quicker access to a search engine, is actually more interested in which pages you visit and how long you spend on them. This information is used to build up an advertising profile, which can be sold on so advertisers know which sites to target and what type of adverts to serve on them, based on a range of profiles. Most spyware is easy to uninstall, but since you don't often realise it exists, the privacy implications are potentially huge.

Adware (a blending of the words 'advert' and 'software') goes a step further and may actively alter the functionality of some applications – typically your browser or messenger program – so

it serves extra adverts or redirects internet traffic to sites other than the ones you intended to visit. This is done to generate revenue for its creators and can be as simple as embedding its own adverts into a page that would normally show someone else's or as devious as redirecting your Google searches through the creator's own affiliate program. Certain adware will even prevent you from searching for fixes, intentionally blocking access to anti-malware websites. Where spyware attempts to stay hidden (and indeed, sometimes tries to be actively useful in some way, if only as a secondary effect), adware tries to make sure you don't notice it and think that the adverts are coming from somewhere else.

Ransomware is the worst of the bunch, a type of malware that quite literally holds your system to ransom. Adware and spyware might be on the fringes of legality, but at least they're harvesting data that has actual value to someone.

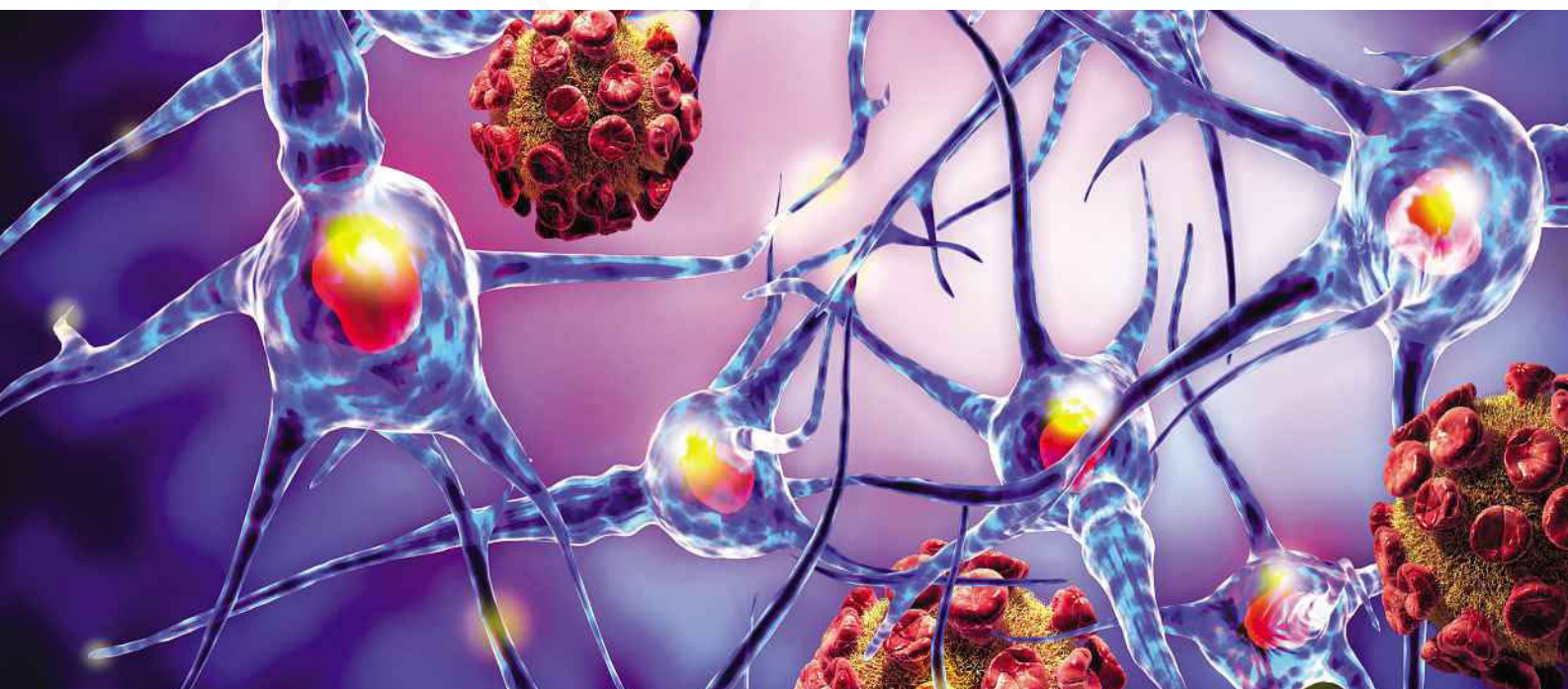
Ransomware simply demands that you pay up, locking your system until you do. The more insidious examples of ransomware will go so far as to encrypt your hard drive and force you to pay for access to your own files, which will otherwise become inaccessible forever.

At best, you lose the money you've paid them, and the software gives you control of your system back long enough for you to remove it. At worst, your credit card details are stolen, and the software remains in place, demanding ever more money. Some ransomware may be 'scareware', which lies about the nature of the payment, perhaps by claiming you have to pay a spot-fine for illegal activity or that your system has been infected and you should 'subscribe' to protection, but which doesn't actually do anything to back up those claims (hence scareware – it scares you into paying).

It goes without saying that you should never make a payment through a ransomware program. Instead, strong anti-malware protection and backup policies are the best defence against it.

Although many forms of malware are installed semi-legitimately (either by asking the user to do it under false pretences or by bundling themselves up with legitimate software by

“ Ransomware is the worst of the bunch, a type of malware that quite literally holds your system to ransom ”



paying the developers a fee), some programs dispense with the formalities entirely. These 'drive-by' installations are performed automatically and without permission through exploits and security flaws on your machine. While it could be argued that some types of adware and spyware don't harm a system too badly, the real concern is that these programs open up security flaws on your system and leave you further vulnerable to attack.

Indeed, if left unchecked, more and more adware will build up on your system, slowing it down substantially. Eventually, things will become so clogged up that a complete reformat and reinstall becomes your best option. Malware is one of the most common threats to modern PC, probably because it works so well: most users are simply not savvy enough to get rid of it on their own means. To remove malware manually you have to be familiar with registry editing, background services and file systems on a level that's simply beyond most users.

Many programs exist that can remove malware for you, but prevention is always better than cure. To minimise the risk, make sure you have the latest security updates to your operating system installed and, similarly, make sure

you don't agree to install software unless you're certain that it's legitimate. If you're invited to install a program while visiting a website, there's a strong chance that it'll be nothing but thinly disguised malware. To avoid participating in your own infection, make sure you read all dialogue boxes properly and always click 'cancel' if it's something you don't want or don't understand!

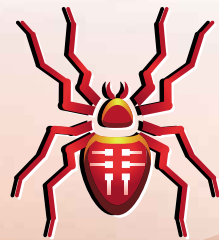
Rootkits

A rootkit is a type of spyware that allows unauthorised users to act as the administrator (or 'root' user) for a system, without even the need to crack the password for it. Once installed, rootkits open a backdoor that can allow any user full control over the target PC, to the extent that you can't really see the infection from within an infected PC; it allows modification of behaviour on a level between the

operating system and hardware, as opposed to between the operating system and user like regular forms of malware.


The most common rootkits are used by other malware programs to hide their existence from anti-spyware scanners, preventing their own removal. By exploiting the rootkit, a spyware program can use the administrator-level access it grants to prevent anti-spyware scans from detecting their own registry keys or active processes. Their popularity has waned of late due to an aggressive campaign against them, but a few years ago rootkits were everywhere, and there's no guarantee that modern systems are completely immune to them.

Rootkits can be installed by just about any method, though perhaps the most famous example is the Sony-BMG copyright-enforcement rootkit, which was designed to prevent computers from copying



Virus Detected






the contents of music CDs but in doing so opened up a backdoor that compromised any PC with the rootkit installed. The worst part of the whole affair was that the program could be installed simply by putting the CD in the drive, if autorun was enabled (which it inevitably was on systems of the era).

While there are some examples of legitimate rootkits to be found in hardware emulation and security software, the majority are used to exploit a PC illegally. Frustratingly, the very nature of rootkits means that you often can't stop them after installation, if at all. They hide beneath the normal level of detection and can be all but impossible to remove without using software designed for the task.

The Future of Viruses

Virtually as long as there have been computers, there have been programs written that, in one way or another, are intended to have a malicious impact on a computer system. The big question isn't 'Will there still be malware in the future?' It's 'What will malware be like in the future?'

Although much effort has been put into eradicating malicious software in its entirety, the war to keep computers safe and secure will always be an ongoing concern. As the continued computerisation of society affects everything from TVs to traffic control, the opportunities for malicious software to cause damage continues to grow. As recently as a few years ago, the idea that your computer would be able to spontaneously bombard you with adverts based on your hourly behaviour sounded like a nightmare scenario, and yet it is instead a harsh reality for millions of computer users logging into their computers each day. In retrospect, the opportunistic floppy-bound viruses of the 80s and 90s look almost quaint by comparison!



The next obvious step for malware is to migrate away from traditional PCs. The number of smartphones, tablets and ereaders has exploded, and it's a logical expectation that malware will eventually make the leap to such devices in earnest, bringing with them the same kind of irritants

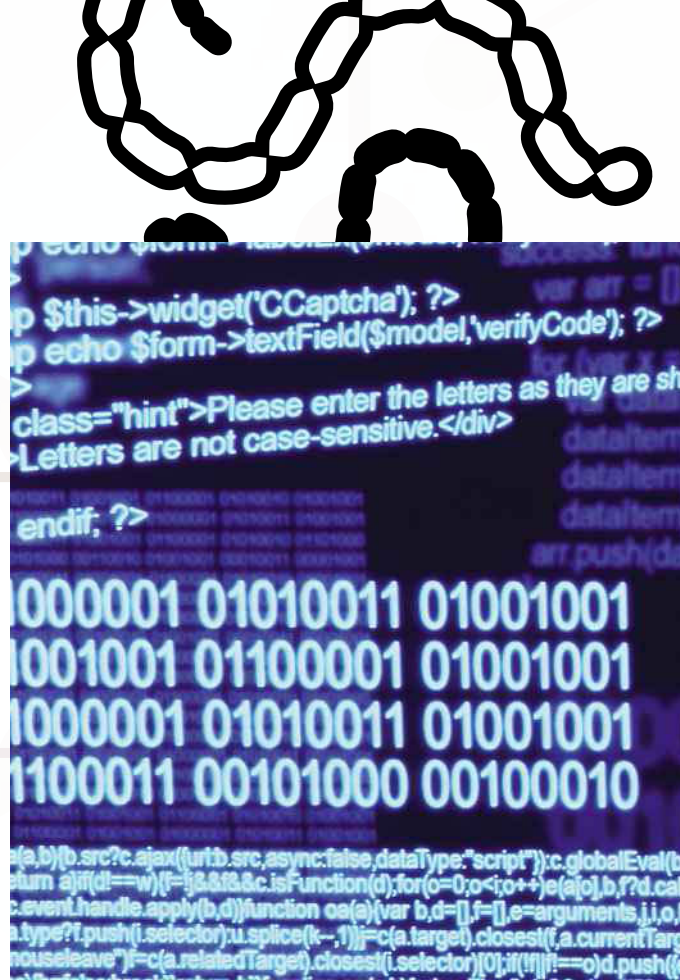
and inconveniences as you already regularly encounter on your home PC. The good news is that the systems have been so tightly engineered that it's hard to infect modern mobile devices, but there's sure to come a day when a security flaw or leaked credentials leaves millions of systems vulnerable.

Of course, while developers can plug security holes, there's no stopping users from doing what they want, which is why social engineering is becoming more prevalent. The first ever mobile virus, the Cabir worm, required users to manually accept the transfer of the worm onto their phones, but even that didn't stop it from actually getting out. Users happily accepted a Bluetooth application transfer from a completely unknown source, then ran the software. It's therefore likely that the malware of the future will require users to actually be complicit in their own infection, adding insult to injury!


An infected mobile device brings with it obvious new avenues to exploit. Gone are such rudimentary tactics as serving adverts and tracking web pages; modern mobiles track everything from where you visit to when you sleep to how many times your heart beats a minute – data that any sufficiently maniacal advertiser would salivate over. Direct theft is also easier, thanks to NFC and wallet-based payment systems. It's not beyond the realm of possibility that malware in the future could use your mobile phone to try to make payments without your authorisation.

In the worse cases, your mobile might even become complicit in a real-world theft. It would only take a rudimentary amount of access to make a smartphone alert a third party when you've left the GPS location it understands to be your home, informing them that the building might therefore be unoccupied and vulnerable. Not a happy idea.

As well as looking at what tomorrow's malware will do, we should also look at where it's likely to come from. As depressing as it might be to think about, malware does not simply spring forth into existence – someone, somewhere,



Exploit Kits: The New Threat of 2015

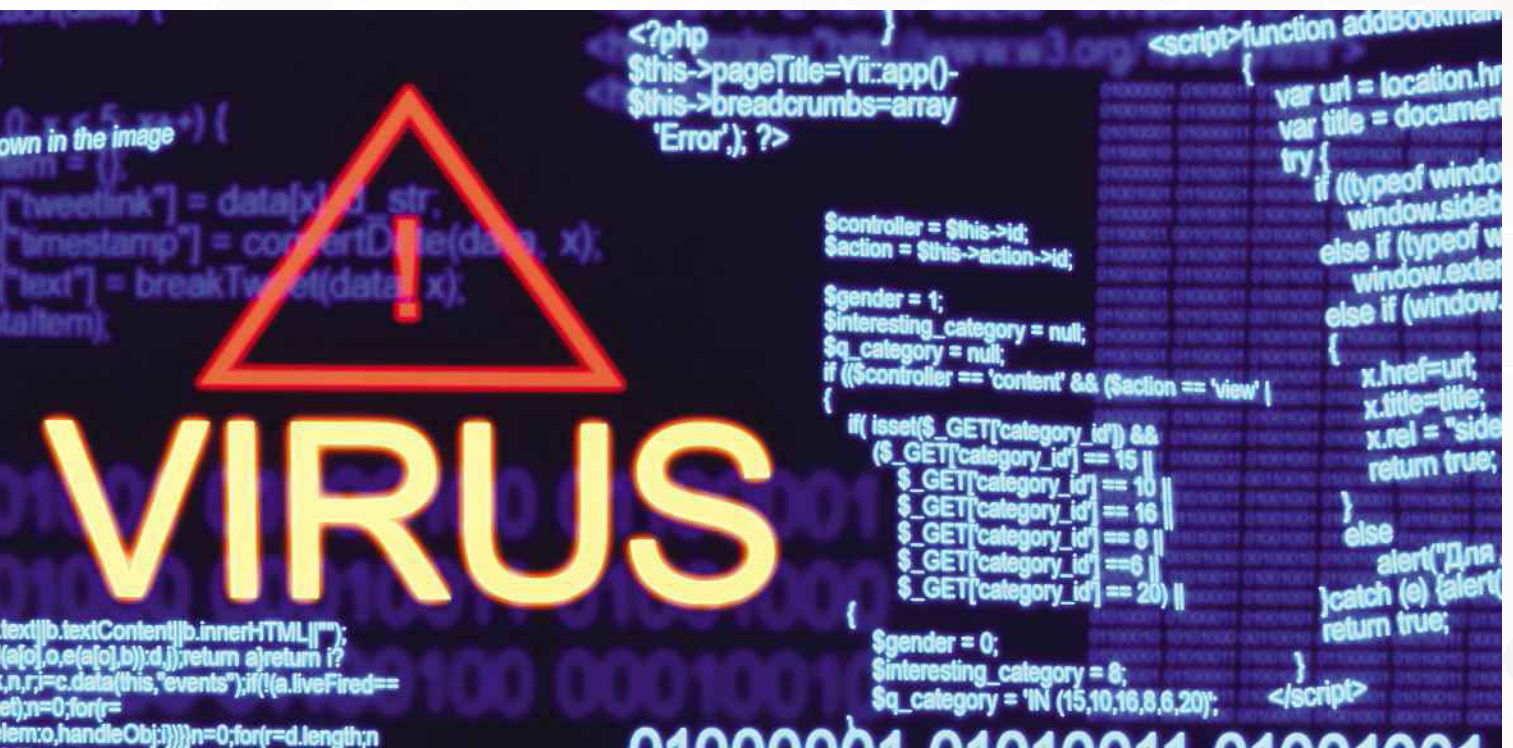
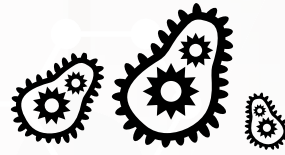


Although malware infections used to be the result of downloading dodgy shareware or visiting websites of dubious reputation and quality, it's increasingly the case that malware gets installed on the computers of people who have done nothing that remotely invites the problem. The reason for this is a new type of threat: the exploit kit.

Exploit kits have been around for a couple of years, but their use has significantly ramped up in the last 6-12 months and is reportedly a factor in almost two-thirds of all new malware infections. The kit itself is a piece of code which automatically catalogues the software your computer is running and finds any existing vulnerabilities that can be exploited. The code itself is embedded on web pages, which you hit during normal browsing, but because they're part of a third-party tracking service or ad network, both you and the website's owners may not even realise they're being used.

It's important to note that exploit kits aren't malware in their own right but delivery vectors for malware. Essentially, exploit kits make it simple for drive-by installation of malware to occur, because they don't look for one specific vulnerability: they're actively probing for any vulnerability.

The good news is that it's rare for exploit kits to take advantage of zero-day vulnerabilities, because they rely on their ability to test a wide range of security holes and therefore take a lot of time to create. This means if you keep your software up to date, you should be immune to the vast majority of attacks they propagate.



has had to sit down and actually write the code.

In the past, virus writers traditionally operated in the Western, developed world. For the first 15 years, malware was mostly written by 'hobbyist' programmers in Europe, the US and Australia. Such crime was mostly disorganised and untargeted, but as computer systems became more and more interlinked because of the internet, the creation of 'criminal' software slowly became more and more targeted, and better organised for maximum ruthlessness. The hobbyists were turning professional.

Over the last few years, more and more malware has started coming from countries that were part of the Soviet Union – Russia, Latvia, Kazakhstan and Ukraine. Other developing economies with large numbers of skilled computer workers but not enough job opportunities in the IT sector, such as Brazil and China, already see potential workers taking up cyber-crime to make a living. After all, such a lifestyle often presents a lucrative and relatively easy way to make money; the world is up for grabs, and the crime is difficult to combat over international boundaries. Today, the countries that originate most malware are Russia, China and South America

“ As long as there are computers and software, there will be people attempting to abuse them ”

– all of which have developing economies of growing size, complexity and importance.

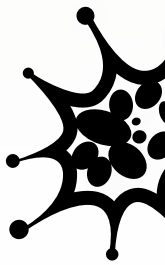
In early 2008, computer security company F-Secure released a report that showed a growing level of e-crime coming from countries such as Central America, India and Africa. The trend continues today, and it's likely that crime in these three areas will continue to rise until they are definitively producing the next wave of malware. Attacks are likely to become more sophisticated as broadband reaches these areas (allowing high-speed links to any computer on the planet) but, as with current crime hotspots, the lack of a significant job market capitalising on the infrastructure diverts skilled computer users towards criminal activity.

These trends don't indicate that malware will stop coming out of the Western world, however. The overall volume may be reduced, but just as software engineering becomes more complicated in Western economies, so the development of malware

will follow suit. The open-source movement has been around for long enough to become cemented in the ideologies of technically skilled programmers, and that means that 'open-source malware' – already in existence – may not be far away from becoming a much more serious problem.

As you may have guessed, the future of malware is rife with conflicting possibilities and probabilities. It's easy to see the general trends of malware – where it's coming from and what it'll do – but as with any attempt at futurist predictions, it's hard to see whether there's a game-changing development lurking around the corner.

One thing is certain, though: as long as there are computers and software, there will be people attempting to abuse them for their own purposes, and that means malware will be a part of all our lives. Sadly, there's no happy ending here – just a constant threat that simply isn't going to go away any time soon. [mm](#)





Keeping Your Wireless Network Secure

It's vital that you have security on your wi-fi network. We look at everything you need to know to stay safe

For all its popularity, it's easy to forget that wireless networking is still a relatively new technology, and it's one that brought new security risks with it. Essentially, your data gets flung into the digital ether, and everyone from your neighbours to a passing stranger has the equipment needed to pick it up.

Wi-fi itself may not be a very secure protocol, but by enabling wireless security systems you can encrypt the data and stop it reaching the prying eyes of those around you. Whatever your wireless network is used for, you need to have some form of security, but which should you be using and why?

Why Have Security At All?

These days, manufacturers ship routers with security enabled by default. But what's so bad about running an unsecured network? After all, you can find them being used in public, so why does it matter if you run one at home?

Unsecured networks have only one real benefit: they're incredibly easy to connect to. Of course, this is also the thing that makes it such a poor choice for home use. With no encryption or security, the data passing through the network is ripe for interception and can be captured by anyone using some very simple software tools.

But on a more practical note, it means that others can use your broadband connection. The consequences range from the minimal (your connection speed is slowed by extra traffic) to the financial (your broadband cap is exceeded, incurring top-up fees) to the most severe legal penalties (the person breaks the law using your connection and it's traced back to your account).

With that in mind, having no security on your wireless network goes beyond being just a bad idea – it practically invites trouble. Connecting to an unsecured network without authorisation is illegal, but there's also an imperative for the owner of a network (i.e. you) to keep it secure.



Securing Your Network

If you're running a modern network, you should have WPA encryption enabled, and specifically the latest and most secure iteration, WPA2-PSK. The 'PSK' part stands for 'pre-shared key' and refers to the

'personal' or 'home' version of WPA where the passkey must be entered by each user to gain access. The alternative is 'WPA Enterprise', which uses a RADIUS server for authentication. As the name suggests, WPA Enterprise is intended for use only on large business networks and is designed to make managing a large number of wireless clients into a simpler process, rather than a more secure one.

Most modern routers come with WPA2 already enabled and the relevant key printed on a sticker or accompanying card. Although it isn't entirely necessary to change the WPA access key from its default, it can be useful – especially if you're worried about third parties who might have access to your router while you're not around.

The best practice for choosing a strong WPA key is very similar to that of choosing a strong password, requiring similar considerations. When coming up with a WPA key, try to devise one that meets the following criteria:

- 1. Long.** Make it at least 13 characters in length. Any shorter will mean that brute force attacks are possible to complete within realistic time-frames. The more characters you add, the less likely it'll ever be cracked.
- 2. Memorable.** While any string of characters will work as a key, if you choose to make that string memorable, then you won't have to write it down or save it on your computer in order to use it.
- 3. Original.** As with passwords, you should ensure that you use a combination of numbers, letters and punctuation to create a WPA key, and that it isn't made up of real words that could be guessed using a dictionary attack.

A simple way to create a memorable passkey might be to take a memorable 'fake' word (perhaps an acrostic of your favourite song lyric or a spoonerism of a famous quote), combine it with your birth date, then separate the segments by punctuation. As long as it's information that you (and anyone else using your network) can remember and that other people can't, it's secure enough to use.

While cracking a WPA passcode isn't impossible, it is time-consuming. If you suspect someone else is attempting to access your router, then changing the WPA key will be enough to put them back at square one.

Altering the SSID (network name) to something generic is also a good idea. Most ISPs ship their routers with a network name that identifies the service provider, such as 'TalkTalk-4C8A50' or 'BTHub5-FJ6W'.

This gives those attempting to access the router a starting point: they can narrow the device down to one of a few used by that ISP and maybe even take advantage of any loopholes or exploits in that device.

You also shouldn't make it possible to connect your SSID specifically to you, because you could unwittingly divulge things about yourself. For example, if your SSID contains your address and you switch the router off while on holiday, people might notice that it's missing and realise that your house is empty. If you use an uncommon name or online handle as your SSID, further details might only be a Google search away.

Choosing a network name to something random that doesn't identify either you or the hardware is a good way to keep your network secure, and it shouldn't affect your day-to-day access either.

What Doesn't Work?

One extra piece of security recommended by some is a MAC whitelist. In case you're not sure what that means, you should first be aware that any piece of hardware with a network connection has a unique MAC address. Where an IP address identifies a software-created connection to a network, the MAC address identifies the specific piece of hardware that the connection originates from. Everything from your network card to your PlayStation 4 to your smartphone has its own MAC address which, in theory, is utterly unique.

A MAC whitelist will restrict network access only to specific MAC addresses and can therefore provide an additional layer of security for your network. One of the benefits of using a MAC whitelist is that

it can be combined with other security protocols, since the authentication occurs at a different level to encryption keys such as WEP and WPA.

But whitelists are tedious to maintain, and as a security measure they're only barely effective. It's trivial for a hacker to intercept your network traffic and change (or 'spoof') their network device's MAC address to use one on the whitelist, allowing them access. MAC whitelists deter only the most casual attackers and less effectively than a WPA key would.

In practice, whitelists aren't really about security; they're about device management. Access points usually allow you to specifically name the devices on a MAC whitelist, so you can then use it to double-check which devices are connected to your network and when.

Similarly, some people suggest that you disable the SSID broadcast (so your network doesn't show up in lists of available networks), perhaps believing that you need to know the name of the network to connect to it. This is not the case.

Disabling SSID broadcast may prevent the network from appearing in lists, but the SSID still exists as part of the traffic being broadcast and isn't encrypted, so it can quickly be found by using network-monitoring software to intercept wireless signals. Again, no semi-determined hacker will be deterred by an SSID broadcast being disabled – it'll frustrate you more than anyone else, because you won't be able to easily tell whether your network is down based on its visibility.

Follow this advice, and you can be sure that your wireless network will remain as secure as possible. **mm**



What Is The Dark Web?

It isn't all just about illegal activity, but is it for you?

Last September a joint operation between 16 European countries and the US shut down an estimated 400 domains on the 'dark web'. These sites were primarily involved in selling drugs and weapons, and the list of targets included the latest incarnation of the notorious contraband sales website Silk Road. It was described as a major blow to the dark web and online crime in general.

But what is the dark web? And what does it contain? Is it just a tool for crime, or is there anything else on it?

Essentially, the dark web is an area of the internet that runs alongside but is functionally separate from the existing World Wide Web, where you'll find normal websites. Dark websites can be visited by any user, but the IP address of the server is never revealed, so it's near-impossible to figure out who's running them, and the sites themselves are not visible from search engines, which makes them hard to find unless you already know about their existence.

The primary tool of dark web users is a modified version of the Firefox browser known as Tor. Its name is an acronym of 'The Onion Router' which refers to the way the traffic it handles passes through many layers

“ Tor isn't the sole means of access for the dark web ”

of encryption, just as there are many layers in an onion.

Tor itself isn't actually illegal. Indeed, the browser was developed by the US Naval Research Laboratory, and its development continues to be funded by the US State Department. The primary purpose of Tor is to hide a user's identity and location through a combination of spoofing and deliberately circuitous traffic routing, which forces requests to pass through several servers, each of which is encrypted along the way.

Along these lines, dark websites run a special web server which only delivers information to Tor and not regular browsers. The effect is that the site and site visitor never exchange their actual IP addresses, so there's no way for either to track one another. Contrast this with a regular website where IP address exchange is typical and you can understand why the dark web has become a magnet for illegal activity.

Tor isn't the sole means of access for the dark web, of course. Other sites and users favour services such as I2P (an abbreviation of the 'Invisible Internet Project'), which is a free, open-source network layer, which can be used to transmit data securely and anonymously, much like Tor. Silk Road Reloaded used this protocol, and like any other dark website the only way to access it was to use the protocol and know the correct address in advance.

As we've mentioned already, the dark web's infrastructure makes it a magnet for criminal enterprises that would be quickly shut down if they tried to operate on a standard web

server model. Although drugs and weapons are popular, the breadth of available contraband encompasses everything from malware to bomb-making equipment to child abuse images. Lists of cracked usernames and passwords are available so that hackers can further their illegal activities. If you can think of anything dangerous, threatening or upsetting, there's a chance it's available on the dark web.

But despite this, as with many technologies it isn't the idea itself that is bad so much as the way people have decided to use it.

For example, dark websites can also be useful for communicating within countries where the government has a tight rein on internet traffic, such as China or North Korea. The heavily encrypted and anonymised service means it can be used to circumvent surveillance by individuals and the state, making it a lifeline for the politically oppressed. Indeed, given the recent discoveries about the extent to which the US and UK governments are surveilling people, you might even prefer to use something like Tor yourself simply to ensure that you can't be caught out.

Although the term 'dark web' tends to be used as a catch-all for criminal sites, that's not its sole definition. Similarly, you may hear the term 'deep web', which specifically refers to pages that search engines cannot find. The dark web is a subset of the deep web, but the wider deep web is

far more mundane, largely consisting of things like user databases, webmail pages that are behind logins and anything protected by a paywall.

Accessing the dark web isn't in itself a crime, and indeed there are legitimate sites you can visit that use the Tor protocol. The military uses Tor, journalists use Tor, political activists and company executives may all find Tor useful in some capacity. Even if you just want to keep your browsing activity hidden from other users in your house, Tor can help. All you have to do to get started is download the Tor browser (www.torproject.org) and install the free, downloadable browser.

It's worth noting that despite Tor's apparent security, the raids that took place last year still managed to shut down a number of high-profile sites. It's unclear how this was achieved (and is likely to remain that way), but Tor's developers are stumped. If the service or its associated technologies have a flaw, the Tor project would need to learn what it is so they can correct the software and retain Tor's status as the most secure way to communicate online – if only because such a flaw would threaten Tor's legitimate, non-criminal users.

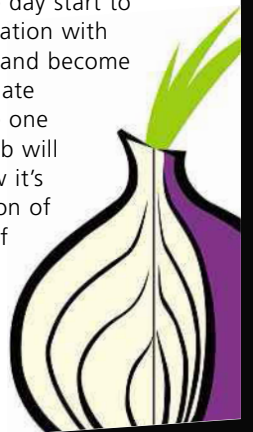
“ It isn't the idea itself that is bad so much as the way people have decided to use it ”

At the same time, the fact that some of Tor's most visibly illegal sites weren't caught in the raid does suggest that the reason some sites fell was a result of a problem in some other area of security. Tor's developers pointed out that the code on the Silk Road 2.0 site contained an email address connected to Blake Benthall, who was arrested as the alleged founder. Likewise, it's possible that bugs within the site's page code could be responsible, especially if the marketplaces are quickly hacked together by semi-professionals.

Another theory is that a process of Bitcoin de-anonymisation helped the authorities locate the owners of crooked marketplaces. Like Tor, the Bitcoin currency is thought to be anonymous and geographically

untraceable, but research has shown that it's possible to de-anonymise Bitcoin users to the point of obtaining the IP where the transaction was generated, which significantly narrows the location and identity of users.

One of the problems with rooting out illegal activity on the dark web is that sites are often quick to change or disappear entirely. Long-term operations are dependent on long-term stability, which is something the dark web doesn't have a lot of. It's unlikely to go away for good, though, and perhaps – like its currency of choice, Bitcoin – the dark web will one day start to shed off its association with criminal activities and become a primarily legitimate enterprise. Maybe one day the whole web will be 'dark'. For now it's only a small portion of the internet, but if enough people want it, who knows what the future will bring? [mm](#)



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Mobile Operating Systems

Mid-Term Review

Ian McGurren passes a judging eye over the mobile world's current operating systems

Yes, another year, another round-up of the latest iterations of the biggest mobile operating systems. We've given them a few months to bed in, release the odd point update and even for their desktop counterparts to catch up

(hello, iOS), so have any of them made substantial gains or stupid mistakes, and is there a new best-in-show? Let's take a look at what they all have to offer, as well as considering what features they might be missing that we'd like to see.

Apple iOS 8

If there were such a dull award as an award for 2013's most substantially changed mobile OS, Apple's iOS 7 would have walked away with it for sure. Eschewing the skeuomorphism and shiny Jolly Rancher-esque blobs that defined iOS until that time, iOS 7 ushered in a whole new, simplified design language dominated by layers and block colour. Opinion remains divided even now, but the release of iOS 8 shows that this new look is not only here to stay, but Apple is fully committed to it.



What It Does New

At first glance, iOS 8 doesn't look much different to its forebear, nor even at second, third or more. This is because many of iOS 8's new features – even the headline grabbers – are either hidden until something activates them or they don't work on their own. Confused? That's understandable. Let's look at the big changes:

- Notifications can be replied to within the notification itself.
- Keyboard has been improved, with better word prediction or can now even be replaced with a third-party alternative (yes, including Swype-style ones).
- Your most used contacts will show up in the task-switching pane, for quick calling or messaging.
- Mail finally lets you swipe to delete instead of the rather pointless 'archive' feature
- Apple Pay will hopefully make good on the ongoing promise of contact-free payments both on and offline.
- Health app integrates data from your health and fitness apps for a one-stop place to keep an eye on your goals.
- Family Sharing is a great way to keep a handle on the kids' purchases, by linking them into one family account. It's also a great way for kids to drive you potty with endless app requests...
- Widgets! Well, not really, but Apple has allowed applications more freedom in the OS, so they can feature in the notification blind (a football app would show a score, for example).
- Apps have also finally been given the ability to appear as options in another app, like Pinning an image appearing as an option in Safari's sharing menu when Pinterest is installed.
- Spotlight works in a far more intuitive way, and is now great for launching apps, ideal if you use OS X in the same way. Talking of which...
- If you're an OS X Yosemite user, then Continuity is arguably iOS 8's high point. Open tabs on one device, finish on another, take calls on your Macbook, texts on your iPad – link them all in and keep your productivity going. In use it works well, though not all apps are supported, so don't think you can have a Whatsapp conversation on your iPad via Continuity, but you can take calls on it. You can also finally Airdrop files to and from your Mac.

What It Broke

- Like any new version of iOS, the lower-end devices tend to struggle running it. On the iPhone 4S and iPad 2 / 1st gen Mini, the experience is notably less slick than for iOS 7, so the chances of iOS 9 coming to them are slim. The iPhone 4 doesn't even get a look in, despite having the same hardware as the iPad 2 / 1st gen Mini.
- Many reported issues with permissions, such as for apps wanting access to photos where previously given.
- This appeared related to iCloud backup and often required the user to disconnect the automatic iCloud image backup.
- Other users reported problems from patchy wi-fi to loss of photographs.
- If done over the air, the update was a massive 1.2GB and needed 5.7GB free on your phone. Only got 8GB? It's an update hooked up to your computer for you then, not that Apple tells you this...
- Those photos you've deleted? You might want to check the photo album marked 'Recently Deleted'...

What It Doesn't Do

- Some cool features, such as the swipe to delete in Mail, and share to an app, aren't OS wide – third-party apps need to enable and integrate these features too. Want to share a link to Whatsapp? Tough, the app hasn't enabled it. Swipe to delete in Gmail? It's still 'archive' for you, chum.
- The filesystem is still locked down, and there have been no noises from Apple that this is ever likely to change. And yes, that still means no external storage at all.
- Accounts are still not in iOS, which, for an eminently shareable device, is a huge oversight. Apple would of course prefer we had one each, but really, a guest or kids mode is well overdue.

Verdict

With iOS 7 being such a huge leap, iOS 8 seems a little less of a stark change, and to call it a whole number jump could be a bit far. Arguably, much of what is here would be enough for a point release for other companies. Nearly six months in, if you ask the rider on the Clapham omnibus for their favourite feature, and you'll probably still be met with the word 'um'. That is unless they have been using OS X Yosemite, in which case a working Continuity is likely to win the most plaudits. Where Apple goes with iOS isn't made any clearer by iOS 8, but hopefully iOS 9 will be more exciting.



Google Android 5.0 Lollipop

Now, if the aforementioned award for most substantially changed mobile OS were to be awarded *this* year, then Android 5.0 Lollipop would run away with it. Arguably it's Android's biggest overhaul yet and the most substantial change since 4.0 Ice Cream Sandwich (unlike Apple going only in single numbers, 4.0 is some three versions old, with 4.1 Jelly Bean and 4.4 KitKat along the way). Gone is the holo UI and its somewhat tired, dark-looking design; in comes a bright, layered 'Material' design not a million miles away from that of its Cupertino rival's, but still individual enough to stand on its own merits.

What It Does New

- The headline grabber is that Material UI. If you've kept an eye on Google Now, the layered paper look will be familiar to you, and here it takes over the whole OS. Notifications slide in over the top of the screen, icons are flatter and bolder, applications now live in a rolodex, and animations are smoother. It has the look of geometric art and 70s children's books about it, and that's no bad thing.
- Like Projects Butter and Svelte, Google's 'project' for Lollipop is Volta, its attempt to make Android's use of battery power smarter. From our experience, it certainly adds something.
- Dalvik, the virtual machine that runs apps in Android, is dead, with Lollipop switching entirely to ART (Android runtime). Difference here is Dalvik compiles each app each time it is run. ART does it just the once, so few overheads, more speed and, yes, less battery drain.
- Notifications are more pleasant and informative, plus tap-holding on them takes you straight to the notifications menu for the corresponding app. Here you can easily switch any notifications off, instead of having to menu-dive.
- Priority mode may not seem new, as it's been around in other apps for a while. However, you can finally dictate what can disturb you and when, including specific applications and people.
- Tap & Go is great if you have another Android device you wish to grab all the settings from. Using NFC you just tap... well, you get the picture.
- Smart Lock allows you to finally unlock your device using NFC. Useful, for example, in the car, when you want to set your phone up as a sat-nav and don't want to mess around with lockscreens. You can even use your phone to unlock your tablet.
- Google Calendar has cool month drawings!
- Flappy Android. Getting more than two is an achievement.

What It Broke

- For a new OS, Lollipop can be very 'old device' friendly. Flashed from fresh, the Nexus 4 has run like a dream and even gained speed and battery life, surprisingly. It isn't all plain sailing, however.
- Flashing is still a pain, with some experiencing the 'missing system.img' error that means you will have to push it manually via ADB or just wait for the over-the-air update instead.
- Current users upgrading over the air have experienced far more problems than those willing to completely wipe their devices and start again.
- Battery weirdness. This is more of an annoyance, because with the upgrade, the battery stats often get wiped. Therefore until it becomes steady on its feet, Lollipop's battery reporting is a bit odd.
- The flashlight exhibits odd behaviour after timing out, requiring a reboot to get it and the camera working properly.
- No silence button! Yes, you'll have to go through the pain of pressing the volume down button....
- Encryption is enabled on the Nexus 6 and Nexus 9 – very safe but performance takes a noticeable hit. Plus, if you disable it, you can't get OS updates.
- Lock screen widgets are no more, at least in stock.

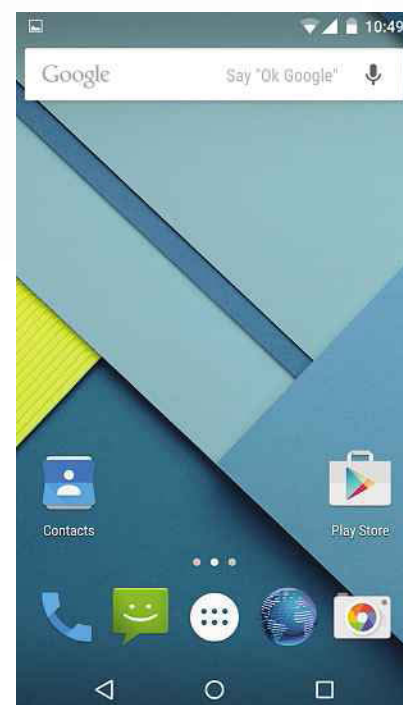
What Is Doesn't Do

- There is still no quick upgrade unless you're on a Google first-party device. Otherwise it's still down to the manufacturer and service provider, so chances are you probably still don't have it some months after the release.
- For heaven's sake, Google, would a 'close all' open tasks button in the switcher kill you??!
- Or the battery level in percent??!
- Gallery is gone and Google Plus Photos is in.
- OK Google is still just for the home screen; you can't get to it in apps.
- Easy, baked in, no faffing joypad support *and* promotion in games.
- Still not as good as iOS at scaling and rotating on tablets

Verdict

Speaking as somebody whose Nexus 4 feels like a whole new handset, Lollipop is quite possibly Google's greatest version of Android yet. The OS feels mature, stylish, slick and unique, plus it's also ahead of its rivals in many ways. A few months in and some of the bugs have been squashed, though lockscreen icons is unlikely to return. Before, many made the choice between the style of iOS and the flexibility of Android, but with Google's design certainly equalling Apple's, the choice is far less clear. Certainly this season's most exciting mobile OS is Android 5, Lollipop.

android



Microsoft Windows Phone 8.1

Ever the runner up, Windows Phone has still proved to be steadfast in an ever-changing mobile landscape. Granted, it has the billion dollar might of Microsoft behind it but, if anything, it has gradually begun to make a place for itself, even if that place is likely to remain third. Like its tablet-powering bigger brother, Windows Phone has made a niche for itself in the mid to lower end of the market, offering a powerful OS for excellent value for money. That you can pick up a Windows tablet with a Windows Phone handset, both of which are more than adequate devices, and get change from £130, is extremely impressive. Windows Phone 8.1 was indeed an iterative bump, but in combination with a plethora of Lumia software upgrades (the 1970s sounding Lumia Denim being the latest), these are much better phones than those from 2013.

What It Does New

- Cortana is Microsoft's much-hyped personal digital assistant, its Siri or Google Now, if you will. Named after the AI of the *Halo* ship Pillar of Autumn, Cortana is a very capable assistant with more than a hint of HAL about her, even singing Daisy Bell when pushed. It's able to work with simple commands as well as longer sentence constructs too, such as 'Remind me to do X when I am at location Y on day Z'. Microsoft is investing in Cortana as the 'face' of Windows and Windows Phone 10, so expect it to only get better.
- Action Center is Windows Phone's long awaited notification tray, with toggle switches and application notifications all a swipe away and all able to be, well, swiped away too.
- IE11 is the new browser, lining up with Windows 8.1, and, despite IE's patch past, it's really good, if a little rough looking in places. And yes, the address bar is still at the bottom.
- An improved keyboard finally offers Swype-style text input, very welcome on the only remaining platform that doesn't allow alternative keyboards.
- Filesystem access is now allowed, to a degree, and Microsoft has even released its own file explorer application.
- Customisation goes from the simple (images for homescreen backgrounds) to the more complex (codable lock screens).

What It Broke

- Well, it hasn't 'fixed' not running on any WP7 devices, it's still WP8 or bust.
- Some alarms didn't carry over and needed to be deleted and re-added.
- Some devices are a touch slower afterwards, especially if not installed from a fresh reset.

What It Doesn't Do

- Beyond the minor changes, there's still little in the way of customisation.
- All Windows Phone devices look the same in operation, from the budget to the flagship; it's only the physical design and sometimes specifications to separate them. This still makes Windows Phone a harder sell.
- It still uses that divisive interface, and it isn't going away.
- There is still no provision for replacing system apps like the keyboard or the browser.
- Apps are getting better but there are still many missing, most notably official apps from Google.

Verdict

Windows Phone 8.1 will please a certain set of people, namely those who already own a Windows Phone 8 device. There are a clutch of welcome changes and improvements, and it shows that Microsoft and Windows Phone is heading in the right direction. There's little here that will make Android or iOS owners consider the switch, except maybe Cortana or just a new way of doing things. But things are on the up, and with Windows Phone 10 just around the corner, Windows Phone is certainly interesting to follow. Which leads us nicely on to...



Windows Phone 8.1

Redesigned around you



Microsoft Windows 10

When you think of mobile operating systems, you think 'good, but limited'. They do a range of tasks very well but they're not quite the same as a 'real' desktop operating system. Therefore it might be a little strange to see what is a 'real' desktop operating system in this list of mobile operating systems. The fact is, however, that any list for tablet-enabled operating systems that ignores Windows would be a list incomplete. Windows 8.1's salvo of staggeringly priced tablets has meant that the desktop OS is finally breaking new ground, and with Windows 10 looking to finally right the wrongs of the past, it may well be a much bigger threat to the tablet status quo.

What It Does New

- Continuum is Microsoft's clever way of getting round the sticky 'Is it a desktop OS or is it a tablet OS?' issue by being both, separately. Putting it basically, keyboard docked? Desktop mode. Keyboard undocked? Tablet mode. Simple and looking effective too.
- It's free! Well, to all legitimate users of Windows 7, 8 and 8.1, the upgrade to Windows 10 is free, as long as you upgrade in the first 12 months.
- The Start menu is now a configurable Start menu on steroids, combining the traditional old XP/7 style with the new tiled Start from 8, hoping for the best of both worlds.
- A personal assistant – yes, beating Apple to the desktop punch, Windows 10 will feature Microsoft's Cortana voice activated personal assistant.
- A 'one-stop shop' finally comes good on the promise made by unifying the Windows and Windows Phone kernels, as Microsoft states that if an app is in the store, it'll run on Windows 10 and on Windows Phone 10 as well. That's not to say all Windows apps will suddenly run on Windows Phone 10, only those in the Microsoft Store.
- Tiled applications can finally break free from full-screen and join the rest of the applications on the desktop in a Window. This is partly to enable Continuum, as apps can go back to full-screen if they wish.
- A whole new browser, currently named Spartan (yes, another *Halo* reference) that may well break from the Internet Explorer name.
- DirectX 12.
- And finally, the command prompt supports cut and paste – something that only took 23 years...

What It Broke

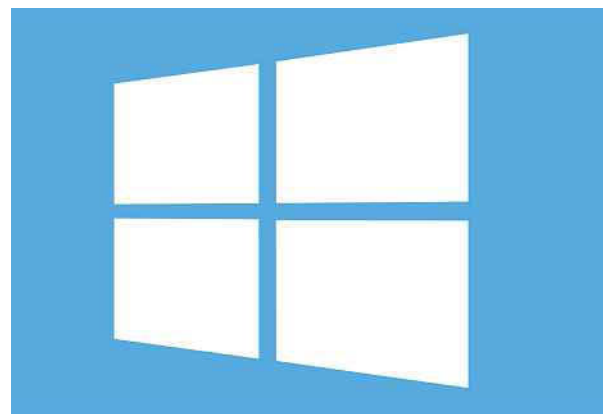
- Well, Microsoft hopes that it hasn't broken anything, only made improvements to 8.1. As it's still in technical preview stage with a limited set of features, there's not much to report. Of course, using a technical beta as your daily OS would, in itself, break plenty, given it's essentially unfinished.
- The erstwhile Metro interface has been heavily scaled back.
- From an enterprise point of view, Windows 10 is still a leap in the dark, though the corporate resistance to Windows 8 has to be overcome, so you can be sure Microsoft is trying to find the path of least resistance here.
- Applications. As with any OS upgrade, especially desktop, some applications and games won't run, requiring patches or some fiddling about.

What It Doesn't Do

- It isn't a huge UI overhaul, and Microsoft will need to work hard to convince Windows 8 naysayers that Windows 10 is different enough.
- Windows 10 isn't the same icon-driven interface as iOS or Android, so it might alienate prospective buyers.
- It's still Windows-based, so it still inherits much of Windows' flaws, such as relying heavily on an ever expanding registry.

Verdict

Though many feel Windows 8/8.1 was unfairly derided, Microsoft knows that with Windows 10, it has to make a huge impact on what is now a vastly changed technological landscape. When Microsoft's last hit, Windows 7, was released in 2009, the iPad hadn't even been announced, and given Windows 8 had been in development since before 7's release, the operating system's touch integration wasn't actually bad at all; Microsoft just forgot about the desktop a little. Windows 10 looks to correct this and build on Microsoft's growing encroachment into the budget tablet world, as well as the rejuvenating laptop market and the ever present enterprise sector. With so much riding on it, Windows 10 may well be Microsoft's most important release ever, but so far, it's looking pretty good.





The Most Impressive OS

It seems that most years have one stand-out OS, so while 2013 was the year iOS stepped up with a new look while Android and Windows phone ploughed their same furrows, 2014 sees Android taking the initiative. Lollipop is the biggest and best revision of Android since its inception. Even previous game changers like Ice Cream Sandwich pale in comparison to Lollipop's level of polish and maturity.

The design is superb, easily the rival of iOS, and it quashes Android's 'ugly' look reputation. In terms of the underlying technology, on a fresh device Lollipop can be transformative, with the new UI, the faster ART runtime, the revamped notifications, the battery life, the user accounts and so much more.

Android is already the biggest mobile OS on the planet, but Lollipop should give

it the credibility it craves, making a case for it to also be the best.

The Least Impressive OS

Sometimes you have to feel sorry for software engineers. UI designers make a few tweaks with shapes and colours and it's applause all round, such is the visual indication of the work they have done. But make a ton of fixes and improvements under the hood and there's barely a hoot from the general public. So while iOS 8 packs a fair few headline grabbing features, it is the least impressive update here. Partly this is due to iOS's maturity, after iOS 7's overhaul; in reality nip-and-tuck is all Apple could really do on the next attempt. Some will be disappointed that there hasn't been a return to the skeuomorphism of previous iOS versions, and some will be upset that there's little to

“ With Windows 10 looking to finally right the wrongs of the past, it may well be a much bigger threat to the tablet status quo ”

show, unless you have other iOS or OS X devices. But while Android is the new pack leader, don't feel iOS is slipping; it's just carrying on regardless.

The Future

In the near future, we will likely see Android go the way of iOS, and there is every chance both will appear to creatively stagnate for a couple of years. In reality there will be tons of tweaks and additions under the hood, but the overall design language of both is set for the time being. However, with Android, that's not to say that proprietary UI overlays won't change, because HTC, Sony, Samsung and so on will always be changing their own, so it isn't like the various Android user interfaces will look the same for the next 36 months.

Windows 10 and Windows Phone 10 may well be the next season's most interesting developments, and while it isn't likely to radically change the phone market, the tablet market may well start to see some change come September 2015, especially as Windows is still the OS of choice for devices bought for education, such as those bought by parents for their children's school, college or university education. If more of these phone and tablet packages come about, they could be too good value to ignore.

Mobile operating systems are in rude health, and nearly all have reached a maturity point where a majority of problems they have had in the past have been remedied. These are platforms that are as competent as they are slick and as powerful as they are friendly, and sometimes it's staggering to think just how far it has all come in around eight years. 2015 may not be looking like a vintage year, but every dog has its day, and maybe the new Microsoft will be the next to have its time back in the spotlight. [mm](#)

Component Watch

After looking at 1TB drives last week, we go four times bigger...

Last week, we looked at the 1TB external drives, most of which were priced around £50 each. What if you want even more storage, though? Much of the cost of an external drive isn't taken up by on the storage, but on the connecting hardware – and that means four times the storage needn't be four times as expensive. That's why this week we're looking at the best deals on 4TB external drives for you to fill with music and downloads to your heart's content!

Deal 1: Seagate Expansion 4TB
RRP: £130 / Deal Price: £100

You won't find a 4TB external drive much cheaper than Seagate's Expansion (at least, not for a few months anyway), but that doesn't mean it's any worse than the rest. There's no doubt that Seagate is a reliable brand and, while this is an unashamedly basic unit, you do still get USB 3.0 connectivity and the relatively zippy transfer rates that can offer. The Expansion is certainly great for people who want to save money and don't care about its no-frills approach.

Where to get it: Maplin (bit.ly/1Ed3qFB)



Deal 2: Western Digital My Book 4TB
RRP: £140 / Deal Price: £120

For just a few pounds more, the equally-respected Western Digital offer a 4TB drive with a whole host of extras, including WD SmartWare Pro software (for local and cloud backup) and Acronis True Image software for system level backup. There's software-based encryption and even a Windows 8 app that helps you manage the drive and its contents. If it was the full £40 more than the Seagate's sale price, it wouldn't trounce it, for but at £120, it's hard to argue against paying the extra.

Where to get it: Dabs (bit.ly/1Eemced)



Deal 3: HGST Touro DX3 4TB
RRP: £144 / Deal Price: £120

Similar to the Western Digital My Book, the Hitachi Touro Desk DX3 has one unique feature worth mentioning: the units are stackable. That means, if you feel the need to buy multiple drives you can pile them on top of each other in a particularly pleasing manner. Aside from that relatively minor point it's business as usual; while Hitachi isn't a poor brand, it does lack the reputation of drive-specific manufacturers like Western Digital and Seagate. Still, at a discount of nearly 20%, it's worth a look.

Where to get it: Scan (bit.ly/1tfTINT)



Deal 4: Samsung 4TB D3
RRP: £120 / Deal Price: £109

If you're a fan of Samsung's 1TB external drive (and let's not beat around the bush: we are) then this 4TB version is likely to be right up your street. With the same sleek, simple design as the drive we recommended last week and no-nonsense performance, the Samsung D3 is an ideal choice for those who like low-price, high-quality hardware. USB 3.0 connectivity is, of course, included, as well as a three-year warranty and auto-backup software.

Where to get it: Ebuyer (bit.ly/1wHcXCL)



Deal 5: G-Drive 4TB
RRP: £400 / Deal Price: £286

Though we're taking a significant step up in price, if you want something with a few more features than the average external drive, the G-Drive might just be what you're looking for. With both USB 3.0 and Firewire interfaces and an aluminium case with integrated heatsink, the G-Drive is always cool and quiet, keeping your data safe at all times. There's no need for a fan, even though it runs full-speed 7200rpm drives, and that makes it a particularly good choice for musicians who need space to record raw audio and who will really benefit from the faster spin speed. A three-year limited warranty only sweetens the fantastic deal on this hardware.

Where to get it: CCL (bit.ly/1GMRVCM)



“ That means four times the storage needn't be four times as expensive ”

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Sony's Upgraded VR Headset On Sale Next Year

Project Morpheus moves on a step

The Apple Watch? It's About Time

£13,500 for top-end model... Gulp!

Thirteen thousand and five hundred pounds will buy you a great many things. A shiny new car, perhaps? Maybe a deposit on a house, or a swanky holiday? Or, how about a new watch, sir?

That's the prospect awaiting Apple fanboys after the dust settled on the official unveiling of the full Apple Watch range at a much-anticipated press event. In fairness, the £13,500 model is one made of frankly ridiculous, high-end materials that is only going to appeal to the sort of person who would happily spend many thousands of pounds on these kinds of gadgets in the first place. Should you be one of those people, note that your wedge of cash will buy a watch in an 18-karat yellow or rose gold case, using sapphire crystal, and twinned with a bright red strap. It will probably never be described as subtle.

For the sane among us, the basic Sport model is priced from £299, which is still an awful lot of money to spend on a product line that has thus-far failed to make big, big money

for Apple's competitors. That could all change with Apple's entry into the marketplace, of course, and there's little doubt that this will sell among iPhone users (the Watch needs to be paired with an iPhone for it to be of any use).

It's worth noting that when you really look deeper into what this can do for you, it's no different from taking your iPhone out of your pocket to utilise all of the apps and functionality. Still, don't let us put you off if this is the gadget of choice for you. It's available for pre-order on April 10th, so let's see how it has fared by the time it gets around to its global release on April 24th.



BlackBerry Takes A Leap

Where are the buttons, then?

The recent Mobile World Congress show sprung few real surprises, although it might be fair to say that BlackBerry did announce a new smartphone that raised a few eyebrows. The Leap phone is a touchscreen 5" 720p handset that offers users

16GB of internal storage, an 8MP rear camera and built-in malware protection. Running off the company's own BlackBerry 10 operating system, it all sounds fairly vanilla as far as smartphone releases go, but consider that John Chen had strongly hinted that that company's next release would have a physical keyboard of some sort and this becomes a different story.

So, a mid-range, touchscreen handset with 25 hours battery life, Full HD video recording, and a host of pre-loaded apps including the BlackBerry Hub, BlackBerry Assistant and BBM Video. Excited about that? If you're a young professional then you should be, according to BlackBerry. We can't help but feel, however, that a return to its physical keyboard roots might be a better route for the company to follow as it looks to get back on its feet after a difficult couple of years. That's a feature that, surely, it is best known for.



We brought you news of virtual reality headsets last issue, courtesy of a bunch of sets previewed at the Mobile World Congress. We didn't, however, cover Sony's update of its own Project Morpheus.

So it falls to us to report that the company has said the new version of the headset will be on sale next year, and feature a few choice upgrades. The key differences include an OLED display instead of an LCD one, making for vibrant colours and also allowing it to keep up with its key rival and current market benchmark, the Oculus Rift.

Graphics-wise it can handle 120 frames per second with a 120Hz refresh rate, which is better than the likes of HTC's Vive headset that we covered last week, and it's been reported that the firm has held off on announcing the upgrade until now because it wanted to wait until it could tie the announcement in with talking about a software update for the PS4 console that could allow it to handle games at the same frame rates.

The design has been handed a more user-friendly look, too – along with better tracking, and a latency time that's been reduced to less than 18ms. This is, on paper, a potentially vital entry into VR cannon.

Kingston Memory Offers Overclocking As Standard

FURY DDR4 available in 8GB to 64GB

Kingston's HyperX division might sound something like out of a Marvel franchise film but it's really, of course, its high-performance memory line. Into that particular fold we can now add the HyperX FURY DDR4 memory, which is notable for being the first HyperX line to offer automatic overclocking via plug-and-play.

Aimed at the next-gen of high-end desktops featuring Intel's X99 chipset and Haswell-E chips, FURY DDR4 will come in 2133MHz, 2400MHz and

2666MHz frequencies in kits ranging from 8GB to 64GB. Taking full advantage of the power efficiency of DDR4 memory, the FURY modules come with a low-profile heat spreader, too.

You can pick them up, or just drool over them, at www.kingston.com/en/hyperx. While on the site, you could also take a look at the expanding Predator DDR4 family. That now comes in 32GB and 64GB kits for high-performance users, so if you're looking for a serious upgrade, it's worth dropping by.



About a year or so ago, I started using Microsoft Security Essentials, after my paid-for security suite's subscription lapsed, and I also started using Windows Firewall.

That was fine, but then I thought I'd see if I could get more advanced options with a third-party, but still free, program. So for a while, I was running Avast's free anti-virus and, apart from the odd nag in the notification area about upgrading, it worked fine.

Somehow, though, I forgot to sort out a firewall, having turned off the Windows one, and it was only recently that I noticed. As far as I know, I didn't get any viruses or other malware on my PC in that time, so either my router's firewall is doing a particularly good job or I just got lucky. I'm honestly not sure. What I do know, however, is that first chance I got, I found a cheap licence for a premium security suite (F Secure) and installed it posthaste.

It just goes to show, it pays to review your PC security from time to time.

See you next week...

Anthony

Editor

Meanwhile... On The Internet...

It's been a week of taking stock in the UK as the authorities started to outline their assessments of the pre- and post-Snowden privacy landscape and what it meant for British citizens. The Parliamentary Intelligence and Security Committee published its report, *Privacy and Security: a modern and transparent legal framework*, a 149-page report (which you can read in full at tinyurl.com/Motl1354a) that assessed the current legalities surrounding the collection of digital data and which makes recommendations about how things should change in the future (tinyurl.com/Motl1354b).

The report concluded that the surveillance activities of UK agencies, infamously revealed by whistleblower Edward Snowden, were not illegal per se and do not "equate to indiscriminate surveillance". However, it also concluded that the legal frameworks that underpin the work of the Government Communications Headquarters (GCHQ), one of the agencies fingered, lack transparency and are "unnecessarily complicated". As an answer to this, it recommended a series of changes to existing laws in order to lay out what was as wasn't acceptable in a much clearer fashion (tinyurl.com/Motl1354d), because the current situation "could be misconstrued as providing the agencies with a 'blank cheque' to carry out whatever activities they deem necessary".

Not everyone was happy with the findings, though or the findings of the report. While the collection of "bulk datasets" by MI5 and MI6 was acknowledged, the committee was not allowed to reveal what that actually meant. On behalf of Liberty (tinyurl.com/Motl1354e), Shami Chakrabati told the BBC that the committee was "a simple mouthpiece for the spooks" and was "so clueless and ineffective that it's only thanks to Edward Snowden that it has the slightest clue of the agencies' antics."

Further concerns about the activities of those charged with handling the massive amount of data our own agencies are collecting about us was raised by a report from the Interception of Communications Commissioner's Office. This report looked into the use of the half a million or so communications intercept authorisations that were issued in 2014 (tinyurl.com/Motl1354f), which outlined the sacking of a GCHQ employee last year over unauthorised searches. That was one of 60 "interception errors" noted in the report (tinyurl.com/Motl1354g), among which some were categorised as "over collection", "unauthorised disclosure", "failure to

If the idea of a Barbie that talks is not creepy enough, how about one that encrypts what a child says to it, sends it over the internet via wi-fi and uses a back-end server to decide on a response (tinyurl.com/Motl1354n)? No, we're not fans, either – and as the whole Internet of Things thing goes, this must be one of the weirder implementations. No wonder there's a campaign against it!

cancel interception" and "incorrect communications address intercepted". The report notes that these errors lead to around 1,400 "consequences", including four cases where child welfare investigations were delayed. Not great, then – especially if you're suspicious enough to suspect that the report probably only scratches the surface.

While one committee was, to all intents and purposes, giving the snooping activities of the UK a clean bill of health ('lose a few pounds, eat a bit more fibre, come back and see me next year'), another was busy defending the Tor network. Yes, you heard that right (tinyurl.com/Motl1354h).

Okay, the so-called Parliamentary Office for Science and Technology's so-called 'POST Note' (tinyurl.com/Motl1354i) carries no legal weight. But its conclusion, that Britons probably wouldn't accept a ban on Tor and that attempting to enforce one could actually strengthen the network, may hold some sway with MPs as a document designed to "anticipate policy implications for parliamentarians" and "help parliamentarians examine science and technology issues effectively."

Aaaaaaaaand Finally...

We have a couple of rap-related things, both in their own way Not Strictly Safe For Work, for you to finish off with. The first is a truly masterful piece of video editing work by Benjamin Roberts (@benjaminrrrrr), who has rather marvellously blended the 90s TV show *Dinosaurs* with Notorious B.I.G.'s 'Hypnotized' in a video so good it's almost enough to relieve the trauma of the show's final episode (tinyurl.com/Motl1354j). If that's not your thing, how about Sarah Michelle Gellar as a rapping Cinderella (tinyurl.com/Motl1354k)? Aha! Gotcha!

.AVWhy?

The 'Hitler Reacts/Downfall' meme has been one the most enduring of the last couple of years (tinyurl.com/Motl1354l). The well-trodden footage of Bruno Ganz's ranting Führer from the 2004 film drama must by now have been re-subtitled hundreds, if not thousands, of times to make satirical points – and raked up millions-upon-millions of YouTube views along the way. Now, though, it seems it's quite possible Hitler Reacts may well have a successor in the form of El Ristas, a meme that appears to have reached a critical mass in the wake of the big Apple announcements that took up so much social media time last week (tinyurl.com/Motl1354m). The footage, of Spanish comedian Juan



Joya Borja (aka 'El Ristas' or 'The Giggles') ostensibly passing comment on the new Macbook currently sits at 2,225,000 views on YouTube and is bound to be reappropriated many more times in the coming weeks. That laugh's going to be everywhere, unfortunately, so you'd better get used to it!

Caption Competition



"I started a new job and they told me I had to punch the clock every morning"

We don't what this chap is up to, but we do know what you made of it all. On to the captions!:

- "The Micro Mart shed has been downsized!" – wyliecoyoteuk
- "These cubicles keep getting smaller" – wyliecoyoteuk
- "Ohhhh!....You said JACK in the box!" – wyliecoyoteuk
- The box said 'install Windows Vista or better' – I chose Linux." – doctoryorkie
- "Not happy with this tardis bought from Fleabay." – shuggie
- "Living in a Box back catalogue goes online." – JayCeeDee
- "Are you sure that Fedexing yourself to Australia is a good idea?" – idunno
- "Google's driverless car is going to change the things kids do with a cardboard box." – idunno
- "They say the craziest people come in small packages." – phantom9
- "Never, ever, tell a geek to think outside the box...." – BullStuff
- "I'm just demoing the new Apple 'Kitten' computer." – EdP
- "Anthony is boxing clever, again." – bigdaddy
- "Mail-Order programmers! Now only 100,000 yen." – HunterTony
- "They told me to think outside the box but I thought I'd start from the inside first." – Thomas Turnbull
- "Well, they did say it should all work out of the box." – Den Mack

Thanks for those, but the winner this week is "Virtualbox, anyone?", courtesy of pesukarhu from the forum.

To enter this week, head to the 'Other Stuff' section of our forum (forum.micromart.co.uk) and say something funny (but not too rude) about the picture below or email us via caption@micromart.co.uk.

Nvidia Puts Up Shield

Console entry for graphics specialist

With rumours of an Nvidia-developed console having been doing the rounds for many a month, the firm has finally, officially let the cat out of the proverbial bag.

The Shield Console (as compared to the Shield tablet, now in its second generation) represents the company's console debut and, as you'd expect, video resolution is its forte. It will be the first to stream in 4K resolution, a feature that differentiate it from the big boys and other Android-based gaming systems we've seen.

Under the hood is a Tegra X1 processor, and a 256-core GPU promising twice the Xbox 360's graphical performance. The Android OS will use the Google App store and link into a user's Google account

when coming up with content suggestions, it will also stream PC games using Nvidia's Grid streaming service – at 60fps in some cases.

As for the price, it will cost our American cousing \$199 when it launches in May. We should get it later in the year.



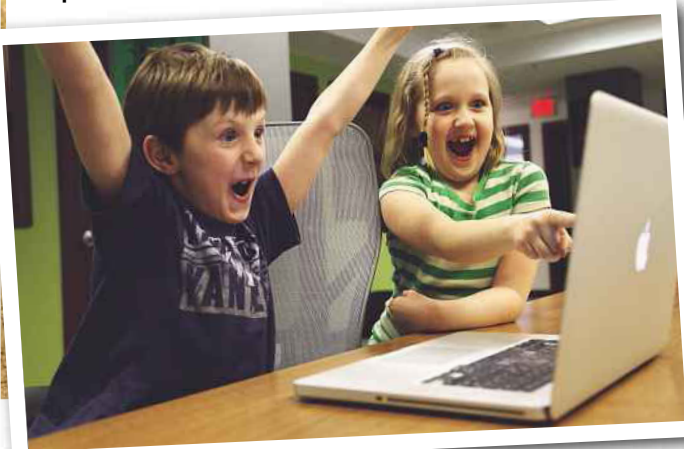
Windows Users Open To Freak Issue

Security vulnerability affects millions and millions

Windows PC users are being warned to look out for the 'Freak' security vulnerability, which has put hundreds of millions of users at risk. When it was first discovered, Microsoft suggested that the vulnerability only represented a threat to mobile devices and Mac systems. Now, however, Microsoft has dug deeper into the problem and discovered that Windows PC

systems are also at risk. Security experts have said that the Freak bug can allow hackers to force weaker encryption on certain websites.

While it's reportedly hard to exploit, Freak's threat remains serious enough for Microsoft to warn all and sundry. In the meantime, Microsoft, Apple and Google are all reported to be working on patches, which hopefully could be out there by the time you're reading this.



Snippets!

Crossy Road's Millions

We're all in the wrong business! The mobile game *Crossy Road*, which is basically *Frogger* for a new generation, has apparently made \$10m in little over three months since being launched last November. \$10m! Aaarghhh! Sorry. The bitterness is all shouted out now. Let's continue.

The developer behind the hit revealed during a presentation that the game has been downloaded over 50 million times and that \$3m of the revenue has come in from in-game advertising for other mobile games.

Mayer Harasser Nicked

A bloke who has been convicted of harassing Yahoo's Marissa Mayer has now also been arrested on suspicion of sending her graphic emails.

Charged with stalking, Gregory Calvin King faces the prospect of spending 20 years in prison. Apparently, he has a long and pretty unsavoury history of bothering Mayer in recent years, so it looks like he may be facing down a considerable amount of time behind bars.

Comments Could Lead To Jail Time

An American has been arrested over in the United Arab Emirates after he took to Facebook to complain over his employer. The helicopter pilot posted some disparaging comments about his UAE bosses on Facebook and now is facing a possible five years in prison if he's found guilty of breaking the country's laws against slander.

The trial is due to begin this month, and serves as a reminder that though cyberspace knows no borders, the rules aren't the same everywhere – and still have to be obeyed.

Amazon Sued In Wrongful Death Lawsuit

Ohio case on supplement brought by family

Amazon is facing a very upsetting lawsuit, which the family of a student who died of a caffeine overdose last year has filed against the company, alongside others that shipped the supplement that he took. Specifically, this concerns

Ohio's rules on the manufacture, distribution or sale of powdered caffeine.

The student died last year just before he was set to graduate, and powdered caffeine was found in his room and linked with the horrendous incident. Amazon hasn't responded to the suit at

the time of writing, but it's named in the filing among a bunch of companies that sold the product, which is also noted as being labelled by the manufacturer as a dietary supplement rather than an over-the-counter supplement. It's an interesting question of liability, no doubt.

amazon.com®

“Strike Week” Tackles Cybercrime

Initiative takes hackers head on

Cybercrime is, and will likely remain for a long time to come, a very real and present danger to the systems on which we rely every single day. As such, we're told the UK's National Crime Agency is taking a hard line on the matter.

It's recently carried out a “strike week” with 25 separate operations carried out across England, Scotland and Wales – and it's reported to have been a success. In total, 56 suspected hackers were arrested and those

caught up in this mighty, concerted initiative are suspected of various nefarious activity, including fraud, DDoS attacks and data theft.

If this turns out to have been half as effective as it appears, it seems a well done is due to all those involved in the operation. We hope that this can have some form of a positive wider impact on cyber security in the UK, a crime

that could potentially effect every single one of us, and which costs the UK economy and awful lot of money, year-in-year-out.



GAME Enters E-sports Business

Buys Multiplay in £20m deal

UK retailer GAME has announced its intentions in the e-sports market by buying Multiplay. The community-based games company deals in live events, gaming services and e-sports and GAME has paid out £20 million for the business. e-sports is steadily growing over here and in snapping up

Multiplay, GAME has opened up the possibility of hosting in-store e-sports events, while also further associating its brand name with the wider gaming community.

This is just another part of GAME's remarkable turnaround from a group that was, just a few years back, in all heaps of trouble and on the brink of disappearing for good.



Google Rolls Out Android 5.1

My boy lollipop...

Google has blogged about the rollout of Android 5.1, an update to the operating system that's promising to better stability and performance. There are also some new features, including support for multiple SIM cards and high-def, crystal clear voice on compatible phones. And therein lies some of the problem – there aren't that many mobile phones yet adopting Android 5.0, so not everyone is going to really see the benefits of this.

Back to the update, though. Device Protection is the other major new feature, and the ability to lock a lost or stolen device until the owner logs in with their Google account. A failsafe status that will remain in place even if someone tries to reset the device to its factory settings.

We like the sound of that feature and if you are lucky enough to own a handset or tablet that can take advantage of this, we'd heartily recommend you fill yer boots.



Wikimedia Sues NSA

No more spying, says Foundation

The Wikimedia Foundation is taking on the US government, no less, in a legal bid to protect the freedoms of Wikipedia users. The Foundation is going to sue

the US National Security Agency and the Department of Justice in a lawsuit that is aiming both barrels at America's mass surveillance policy. The Foundation isn't happy over the practice of

intercepting web communications, complaining over the practice of mass surveillance and arguing that it's a threat to intellectual freedoms.

Fact is that Wikipedia is built on users' contributions and if

any of those contributors were spooked by surveillance, it obviously damages the service as a whole. So the Foundation wants the spying to stop. This one could run for a while, so we'll keep you informed.



CUTTING EDGE WEB BROWSERS

Where can you get the latest web browsers with bleeding-edge features?
Roland Waddilove shows how to get them and what to expect

Web browsers are one of the most frequently updated applications, with new versions released every couple of months. Minor updates are even more frequent, with updates often silently installed in the background. This means that browsers slowly evolve over time through the many updates they receive.

In addition to the stable release software that is pushed out to the public, there are beta versions of all the web browsers. These contain new features that are currently being tested before they're made available to everyone. Beta software is under development and a work in progress, so it might not be as stable the finished product, although web browsers are more stable than you might think. It's not as if they crash constantly, and a beta can be reliable enough for everyday use.

There are even more cutting-edge browsers, which have special names like Firefox Developer Edition, Chrome Canary, Opera Dev and Spartan. These are straight from the developer the minute they've been compiled, and they're untested. They are still quite stable, but you might experience the occasional problem. These browsers sometimes contain experimental features that may or may not make it to the final public release version, which can be exciting to try.

Chrome

Google's Chrome is available in four different versions, each of which is provided on what the company calls a channel (bit.ly/1EdPQjM). The main one is the stable channel, which is the browser that the general public downloads and uses. It is considered to be stable and bug-free, well, as far as is possible with a web browser. Google posts minor updates every three weeks or so, and there are major updates every six weeks. That is a short update cycle and it shows how fast the pace of development is for web browsers.

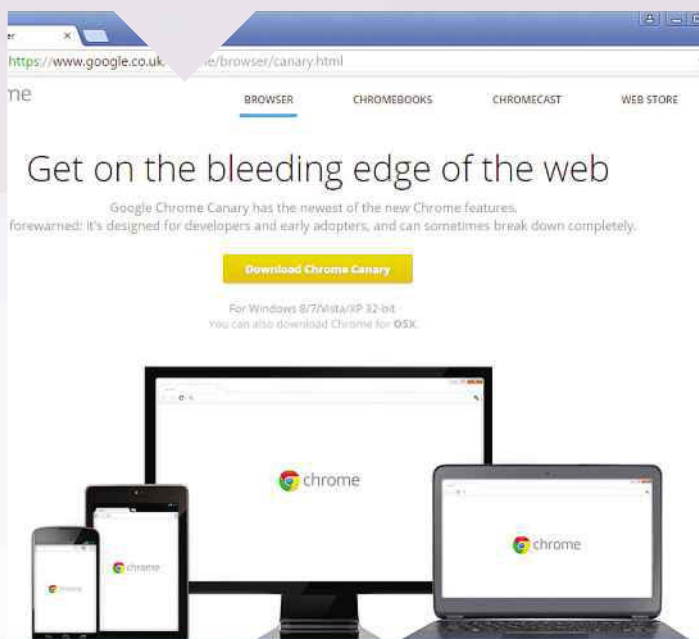
There is a beta channel (bit.ly/1vXT0qn), and this version is updated more frequently. Minor updates are posted every week, and there's a major update every six weeks. That will be when the beta is moved to the stable channel and a beta of the next version becomes available. Running the Chrome beta enables you to see and explore the features that are coming up in the next version of the browser before anyone else gets them. Although it's a beta, it's a stable program, and it's really just going through the final stages of testing before it's released to the general public.

There's a dev channel, which is just a continuous twice-weekly update of the browser. When Google's developers add new features, they compile the code twice a week and post the browser in the dev

channel. When I tried it, there was nothing available, so maybe Google has abandoned it. Try the link (bit.ly/1EdPQjM) and see what happens. I found that it went to the regular Chrome download page.

Canary (bit.ly/1wQ0oPH) is the bleeding edge of Chrome browser development. Like Firefox's nightly builds, Canary is updated daily, so it's brand new whenever you download it. It's released as soon as it's compiled and before it has been tested. This means that there could well be a bug or two lurking around, so don't be too surprised if there is the occasional problem. Brand new features that Google is working on appear in the Canary build first, so you can be the first to try them. It's actually hard to tell what's new in Canary, and there's nothing obvious at the moment.

The Canary build of Chrome uses a separate user profile to the stable and beta versions, and you can install it alongside them without it interfering with them. This makes it useful for test purposes, and it will not mess up your account. One thing to bear in mind is that the user profile consisting of your bookmarks, browsing history, cookies and so on, may not be compatible with the older version of Chrome, so it's best not to use it as your main web browser.



“ Firefox Developer Edition used to be called Aurora, and it's even more cutting edge than the beta ”

Firefox

Whatever the current version of Firefox, Firefox Beta (mzl.la/17O0EbZ) is one version higher. So at the time of writing, the release version of Firefox is 36, and the Beta edition is 37. There's also a Developer edition and this is one more than beta, currently 38.

Firefox Beta always has some great new features that are not in the regular edition. For example, Heartbeat is a Firefox rating system, in which every day a random selection of people will see a widget appear in their browser. It asks you to rate the browser, which provides feedback to the developers and lets them know if the changes they have made are liked by everyone. It is a great feature, but if you want to opt out and don't want to be asked your opinion, enter `about:config` in the address box, find `browser.selfsupport.url` and delete the value.

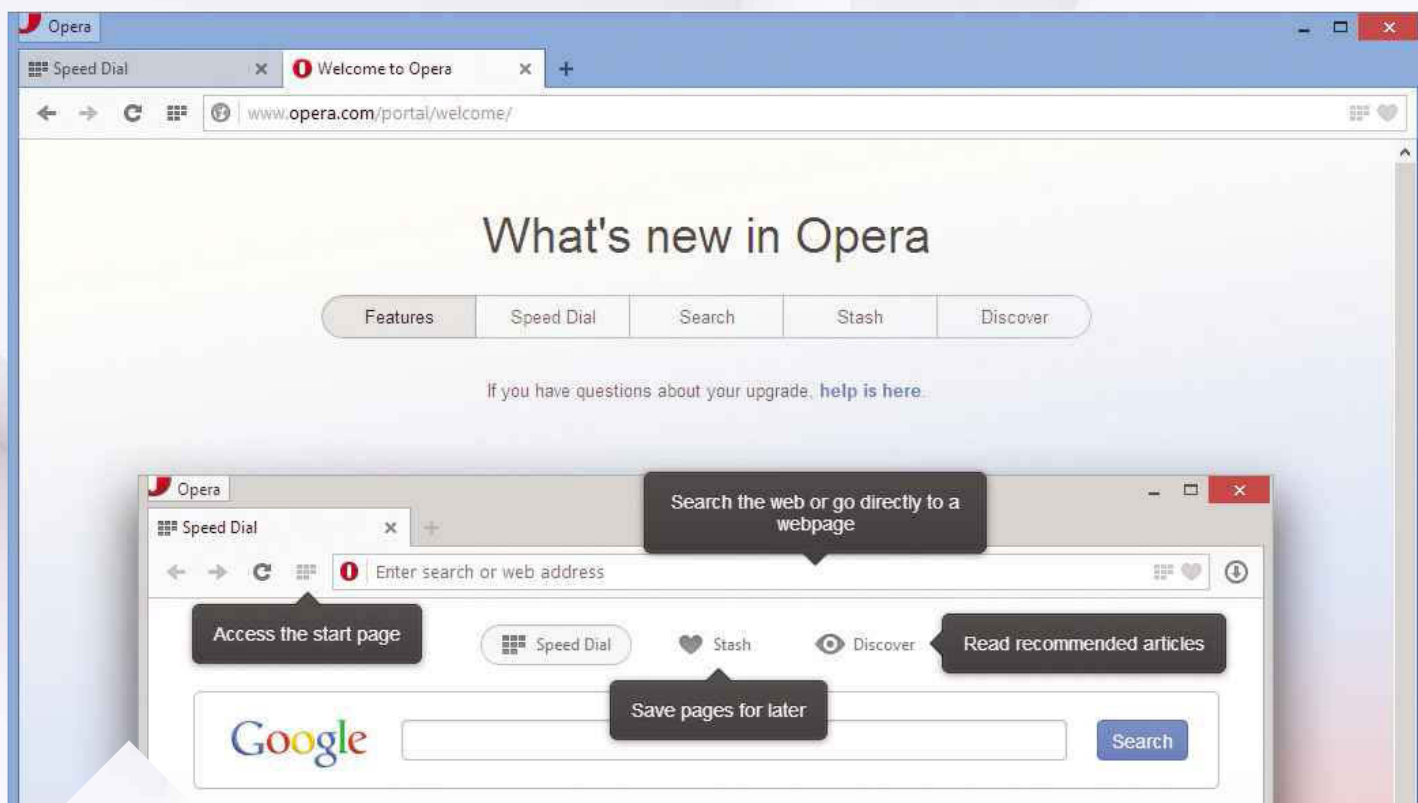
Firefox Developer Edition used to be called Aurora, and it's even more cutting edge than the beta. It contains features and experiments that are not in the regular version of the browser, even the beta. It's where the Firefox developers test new ideas for the browser, and some will make it to beta, and eventually the stable release version, but some will not.

At the download page is a big green download button, but if you click the Systems & Languages link below it, there are Windows and Windows 64-bit, Linux and Linux 64-bit versions. This enables you to select the version that is installed. The Windows download is 32-bit, and it can be used in all versions of Windows, but Windows 64-bit can only be used with 64-bit versions of the operating system. This is a new feature in Firefox,* and previously all versions of the browser were 32-bit. The 64-bit version potentially could boost performance to some degree, and 64-bit browsers and operating systems are generally more secure and harder for viruses, spyware and adware to infect.

The time taken to load web pages should be reduced in Firefox Beta due to a feature called speculative connection warmup. This basically means that the browser will guess which link on the page you're going to click next and get ready. The usual method is to resolve the hostname, which turns URLs into IP addresses using a DNS server and to open a TCP network connection. If you click the link, then part of the work is already done in establishing a connection, so it will be quicker. If you don't click it, you're no worse off.

Firefox Developer Edition uses completely separate settings to the standard edition of Firefox, so when it's started for the first time there are no bookmarks, history, add-ons and so on. It is a fresh start. If you want to transfer everything from the standard edition you should use Firefox Sync (mzl.la/1EJRkTk). This is designed for syncing settings between computers, but it works with two browsers on the same PC too.

If the Developer Edition of Firefox is not sufficiently cutting edge for you, there is a not-so-well-known nightly build. Programmers work on Firefox every day, and they compile a version with the very latest updates and post it on the web for anyone to download. Go to nightly.mozilla.org and you can grab a copy of the latest daily build of Firefox in 32-bit and 64-bit editions for Windows and for Linux. Mozilla says that they are for testing purposes only, and it's interesting to see where the browser is heading over the coming months.



Opera

Opera has always struggled to gain market share and compete against the big three of Microsoft, Mozilla and Google. The browser was around long before Chrome was released and it found it hard to have any serious impact even when there was only Internet Explorer and Firefox, despite having pretty good reviews.

The developers originally built their own web browser from scratch, but the most recent versions of the browser have been based on Chromium. Opera takes the Chromium browser core code, tweaks it and wraps it in its own interface to produce its own browser. This is exactly how Google produces Chrome. Opera and Chrome are therefore very alike at a low level and have similar performance. It's just the interface, menus and extras that differentiate the browser. If you're an Internet Explorer user and want the performance of Chrome but without Google, then Opera is worth considering.

To see what Opera has planned for its next version of the web browser, you can download and run the beta (opera.com/beta). Whatever the current version number is, the beta is one higher. At the time of writing the version available to the public is 27, and the beta is 28. The latest version of Opera is always based on the same Chromium engine that Chrome uses.

Just as with Firefox and Chrome, there's an even more advanced version of the browser called Opera Developer (opera.com/developer). This is updated several times a week, so whenever you download it, it's no more than a few days old and has the latest features.

The best place to find out what features are coming up in the beta and developer versions is the Opera blog (blogs.opera.com/desktop). Opera beta, for example, has easy bookmark syncing between different computers, phones and tablets, which is great when you have opera everywhere. All you need to do is to click or tap the Opera account button at the right of the address box, sign in and the job's done. The beta includes more themes for the Opera start page too.

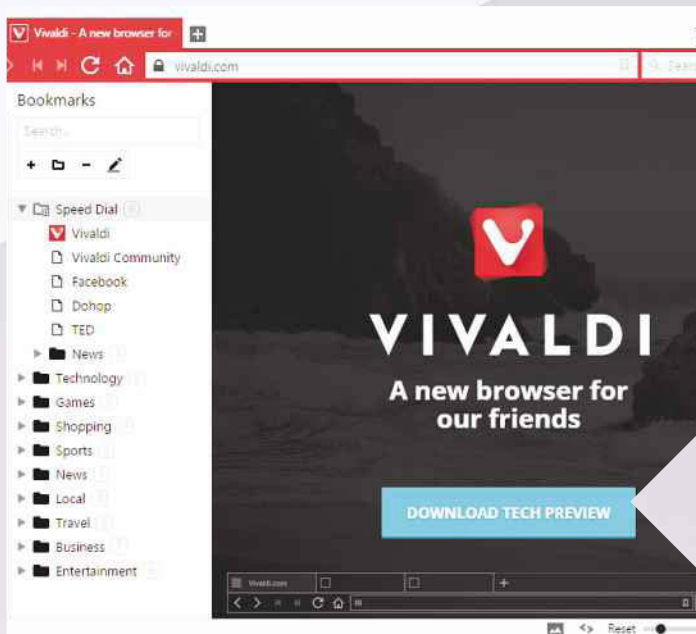
In Opera dev is an easy way to view the web pages that are open on other devices that are running Opera. The browser is available for the Apple Mac, Android and iOS phones and tablets, and it can sync your account. This makes it easy to start browsing on one computer or device, such as your phone, and continue on another, like your desktop computer. The feature is accessed via the Opera start page.

Another useful feature is the ability to see and reopen tabs that were closed, not just in the current web browser, but on other devices too. If you're browsing on another computer or mobile device, you don't need to bookmark a tab to view it later. You can go to the Opera menu on the PC, select Recent tabs and open one that was closed on the device.

Opera dev edition now displays tabs that are playing audio. It can be irritating when you open lots of tabs, and then some music, video or advert starts playing. Now you can see which tab is responsible from the little media icon on it.

There are new mouse gestures in Opera dev, and if you right-click on a link and pull down, the link is opened in a new tab. Hold down the Ctrl key as you do this, and the link is opened in a new background tab. In other words, you stay on the same page when the new tab is created. The way images are displayed has been changed, because they are now centred. This is when you click a link to open it in a page on its own. Images that are too big to fit in the window are scaled to fit, and clicking them zooms in on the point you clicked.

“ Opera takes the Chromium browser core code, tweaks it and wraps it in its own interface ”

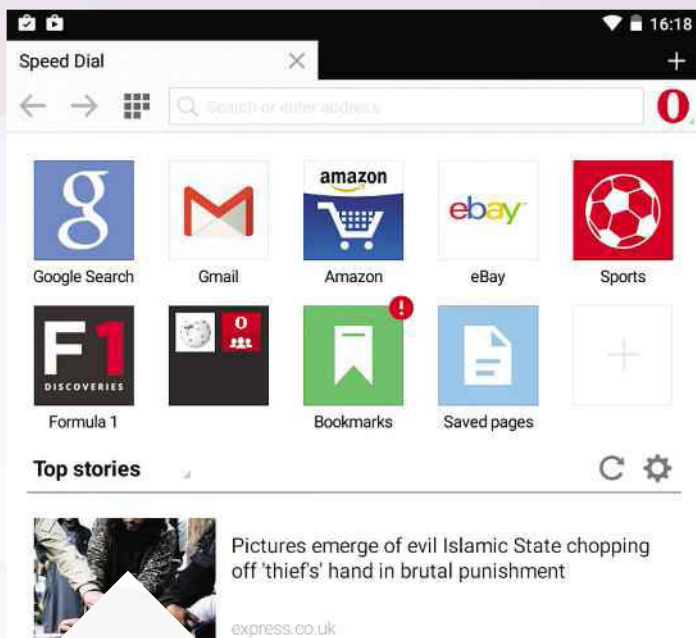


Vivaldi

Opera was originally created by a couple of developers in the 1990s, and it was designed to be small, fast and run on limited hardware. A small community of enthusiasts loved it, but it has grown and changed over the years, and according to some, it has lost its way. Vivaldi is an attempt by a group of developers to get back to Opera's roots and build a browser that is small, fast and feature packed.

The download is called a technical preview, and it's a work in progress. It's usable, but some features have not yet been finished or even added yet. Looking at the Chromium credit on the About page, this appears to be another Chromium-based web browser. This means that its performance should be as good as any other Chromium-based browser like Chrome and Opera, but the difference is in the menus and extras.

Some features look similar to Opera and Vivaldi as Speed Dial, for example, which shows thumbnails of commonly accessed sites on a new tab. It will come with Vivaldi Mail, and Opera also has a mail client too. It has a side bar for accessing bookmarks, downloads and for writing notes. Opera had that at one time.

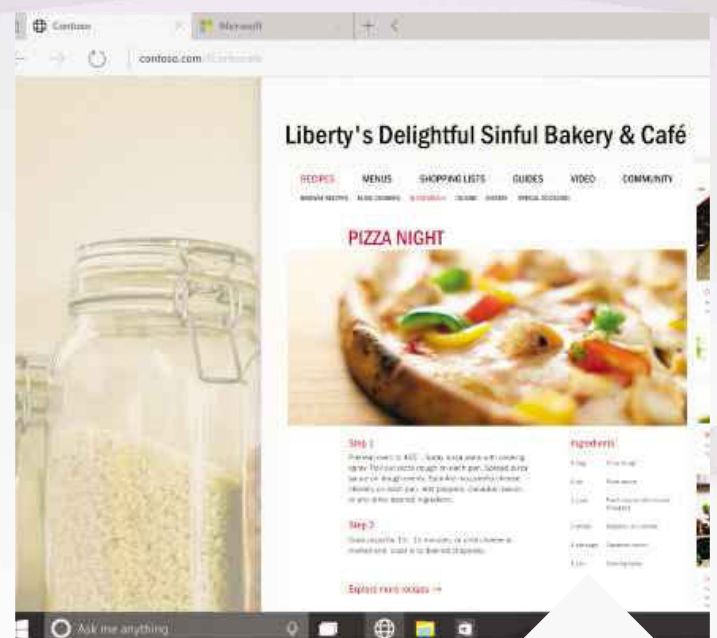


Android & iOS

You may not have realised it, but beta versions of web browsers are available for phones and tablets too. Go to the Google Play store on an Android device, for example, and search for 'beta'. Betas of both Chrome and Opera mobile browsers can be installed. There are, in fact, two Opera mobile browsers: the full fat version, Opera, and the slimmer and lighter Opera Mini. Betas are available of both of them. These apps can be installed alongside the standard browsers, and they work independently.

There isn't any information in the store about beta features, but you can discover new features as they're added to Opera beta by following the developer's blog (blogs.opera.com/mobile). There is a new start page for Opera Mini, and it has bookmarks and top stories in one continuous stream that you can swipe up the screen. There's also a full-screen mode that hides the top bar with the usual status symbols, providing more screen space for web pages.

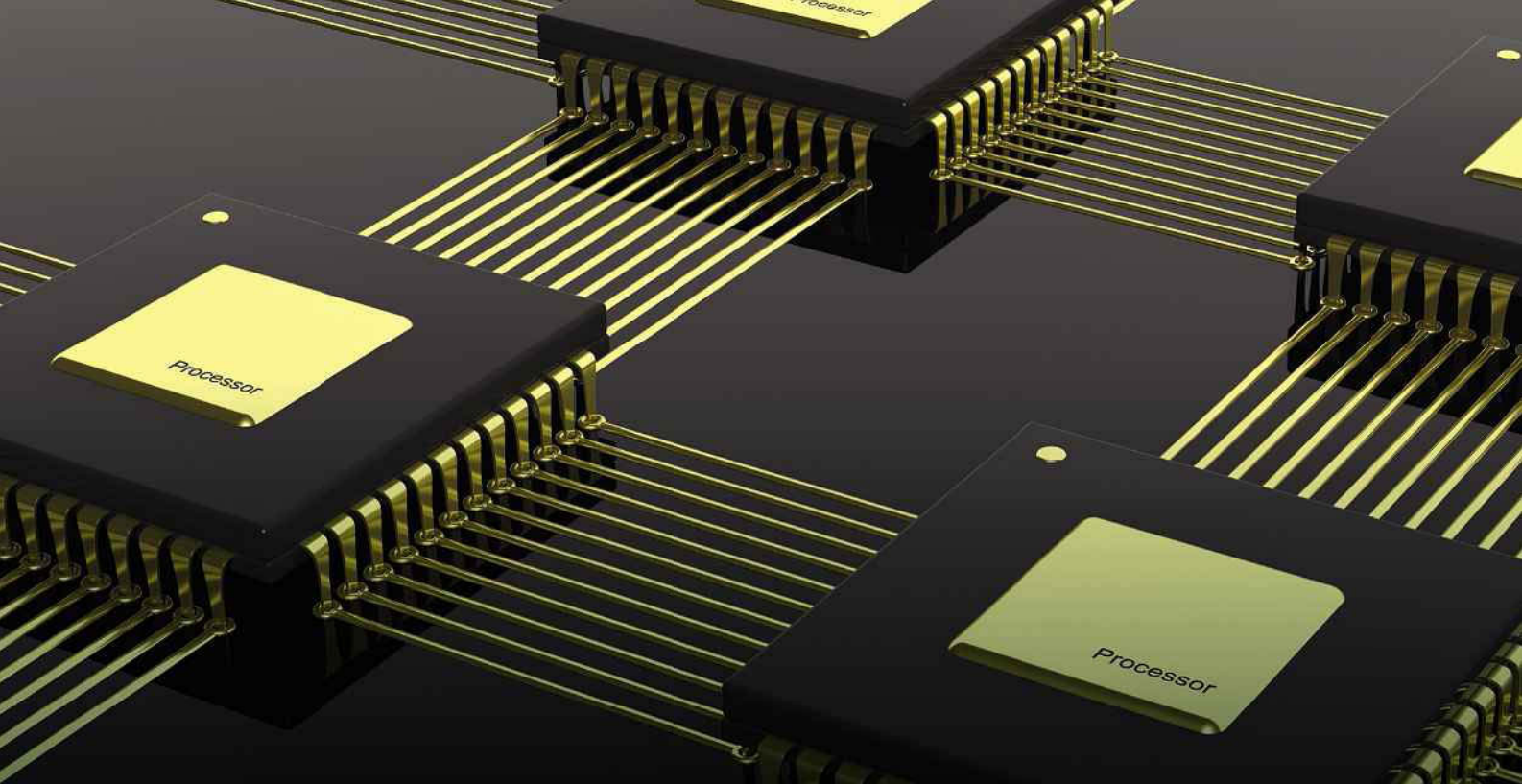
A recent update to the Chrome beta adds the standard pull-to-refresh feature to the browser to reload web pages. There are lots of bug fixes too.



Internet Explorer

It seems that Internet Explorer's days are numbered and sooner or later the browser will be retired – at least with the latest version of Windows. Those that are keeping up with the latest public betas of Windows 10 should look out for Microsoft's new Spartan browser. Spartan has a clean and simple interface that is unlike Internet Explorer. It will include the ability to annotate web pages, which is a bit of an odd thing to do and surely isn't the killer feature everyone wants in a browser. The addition of Cortana for searches and performing actions is more interesting, although Google lets you say your searches already.

Spartan fits in with Microsoft's new vision of software that works everywhere, and it supports the mouse and touch gestures, desktop and mobile devices, large and small screens. The browser will have an Internet Explorer 11 compatibility mode to ensure it works with as many old websites, web applications and online services as possible. [mm](#)



Are Multiple Cores Better Than One?

Aaron Birch examines whether multiple slower cores are faster than a single speedy one

Advancement and innovation is one of the best things about PC technology and it's one of the reasons so many people choose the PC as their platform of choice, be they workers, social butterflies or gamers. The simple fact that the PC you buy today probably won't be the same as the one you run tomorrow makes the whole thing far more attractive. Unlike many other devices, you're not stuck with the exact same thing you buy months or even years down the line. You can upgrade them, refitting parts and boosting your PC's power and capabilities. Better graphics, more memory, a more capable audio card – it's all possible, with even the CPU, the brain of the computer, being upgradeable.

It's this central upgrade that we're going to focus on today, as we attempt to shed some light on some

common misconceptions and general confusion surrounding the central processing unit. Particularly, we're going to look at multiple cores and see what they're all about, how they work and, more importantly, if they're actually any use.

Is a single 3GHz core faster or slower than a dual 1.8GHz model? Do we really need to use multiple cores in order for our PCs to handle more than one task at once? And is it viable to run older, single core CPUs? Let's find out.

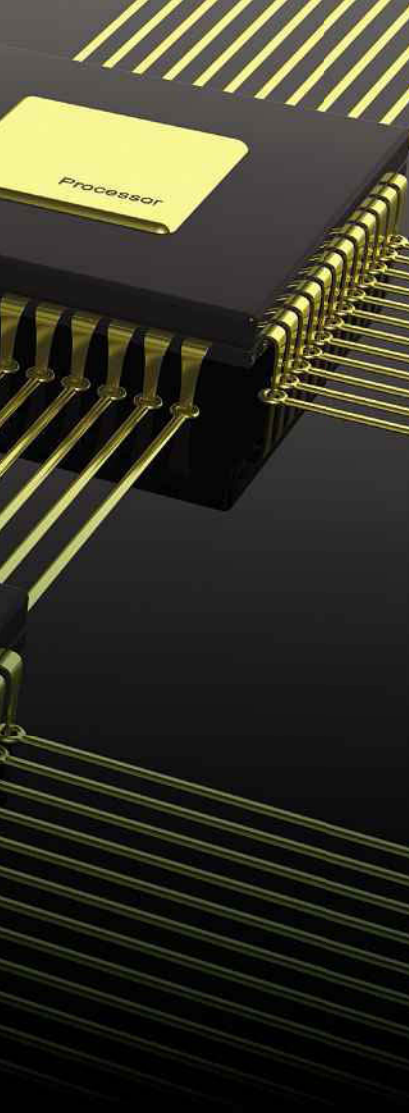
Better With Friends?

We're always getting questions sent into us on the topic of CPU power and multiple cores, and this is very understandable. On the face of it, the whole speed issue of such processors is about as straightforward as a pathological liar lecturing on how to give political speeches. Why on earth would you want to trade in your powerful 3GHz

CPU for one that's only rated at 1.5GHz, even one that has multiple cores? If you have a dual-core 2GHz model, would a 1GHz quad-core actually be an upgrade?

The short answer here is yes. It all comes down to numbers and the fact that today's PC specifications aren't all about clock speeds. Instead, we judge a lot of PC performance by its architecture, and here we're looking at how many CPU cores a system has.

For example, a single-core Pentium 4 may run at 3.2GHz, whereas a dual- or quad-core CPU can have a clock speed of only 2.5GHz. You may think, going from the numbers, that the P4 is faster, but you'd be wrong. The quad-core may have a slower CPU clock speed, but there are four independent cores, each running at 2.5GHz. With four CPUs running at the same time, this grants the PC more processing power. It's the



perfect example of the saying 'two heads are better than one', except with little bits of silicon.

But why are multiple cores a thing? Surely it would have been easier to simply keep making single cores faster, wouldn't it? Actually, no it wouldn't, and CPU developers soon hit a roadblock when trying to produce faster and faster chips.

As the speed and power of CPUs grew, so too did the power requirements and the heat generated by this computational muscle. The more powerful a CPU became, the hotter it would run, and the more power it required for all of its advanced speed. This caused problems in terms of PC architecture and power consumption, and cooling became a problem. Basically, there was a physical limitation on taking a single processor further and the effort needed to cool such CPUs was unworkable. A new solution was needed, hence the move into multiple cores.

Having slower, multiple cores working together uses less power and in turn produces less heat. This unshackled manufacturers once more and opened up a whole new avenue of CPU research. With the ability to utilise several cores, CPUs could effectively run a speed way in advance of single-core models, and multiple threads were the key.

Threading The Needle

The advent of multiple cores mounted onto a single CPU opened up the possibilities of real multi-tasking thanks to multi-threading.

For the layman, the term thread is what we call a single stream of data that's being handled by the system, passed from the program to the CPU to handle. This is an obvious benefit in terms of multi-tasking, as a multi-core CPU can handle more than one thread at a time, whereas a single-core CPU

“ Slower, multiple cores working together uses less power ”

cannot. What's more, although many programs may only utilise one thread at a time, some use more, so even when running a single program, a multi-core CPU can yield better performance. Of course, running multiple programs at once is the major trick up a multi-core CPU's sleeve, and in most cases, systems with such a chip fitted are faster, able to run more programs at once more efficiently. Single-core CPUs can run more than one program at once; we've been multi-tasking with PCs

since long before multiple-core CPUs were created, but overall, the performance hit a system takes here is greatly reduced when you can handle multiple threads with dedicated, separate cores.

Still, to make the most of a multi-core CPU, software has to be developed that can actually utilise this technology, and this is where a good deal of bottlenecking can happen. Although multi-core CPUs will run most programs with no problems, regardless of their design to utilise more than one

Hyper-Threading?

Intel may be one of the biggest CPU manufacturers in the world, but despite this, in many ways it hasn't made things any easier for less experienced PC users when it comes to making the technology more approachable. A good example is Hyper-Threading.

Often confused with threading and multiple cores, Hyper-Threading is a different technology and doesn't have the same effect as multiple cores. It also doesn't magically turn a four-core CPU into an eight-core either, despite what Device Manager may say.

Basically, Hyper-Threading is a clever bit of technology used by Intel to artificially speed up its CPU cores. It creates a virtual, second thread for each CPU core, meaning that data is always ready to be passed to the CPU with little to no downtime. A common analogy used to help explain this is eating. Replace the CPU core with your mouth and the core's thread with your hand. With one mouth and one hand, you can pass food to your mouth and consume it, you can then grab some more food, but you may finish eating before you get more, meaning there's a period of time when your mouth is waiting and doing nothing.

Now, with two hands, you can constantly grab food, eat it and have more ready to go, with no interruption. This second hand is the Hyper-Threading and is how Intel's technology helps speed up your system and why Device Manager may report you have twice as many CPU cores as you actually have.

Is Hyper-Threading useful, though? Well, yes and no. If applications can make the most of multiple threads or you run a lot of separate applications, Hyper-Threading can help speed up your PC, as more information can be handled in a shorter time. However, just like multiple cores, some programs are not designed to support this and multiple threads won't work. In these instances, there's no benefit at all, and in some rare examples, it may even result in a negative performance impact. Hyper-Threading can also generate more heat and use more power.

If you're not sure about Hyper-Threading's use for you, check the kinds of software you're using or give things a test run without it. Hyper-Threading can often be toggled in the system BIOS, so try turning it on or off and see what happens.

core, programs won't run any faster on a multi-core CPU if they're not developed to do so. These kinds of program will simply use a single-core, so they won't show much of an improvement.

Still, even with programs such as this, benefits can be seen, and running multiple programs of this type may still demonstrate increased overall PC performance, as different programs can run on different cores. So even if you're running older programs that know nothing of this multi-core technology, you may still gain performance boosts. You'll still need an OS that supports multiple cores, of course, so that old copy of Windows 95 won't really cut it.

This does have a major downside, though, and one that results in a lot of questions about the pros and cons of more, slower cores or faster fewer ones. If a program

“ 3D rendering is another task that can push a CPU to its limits ”

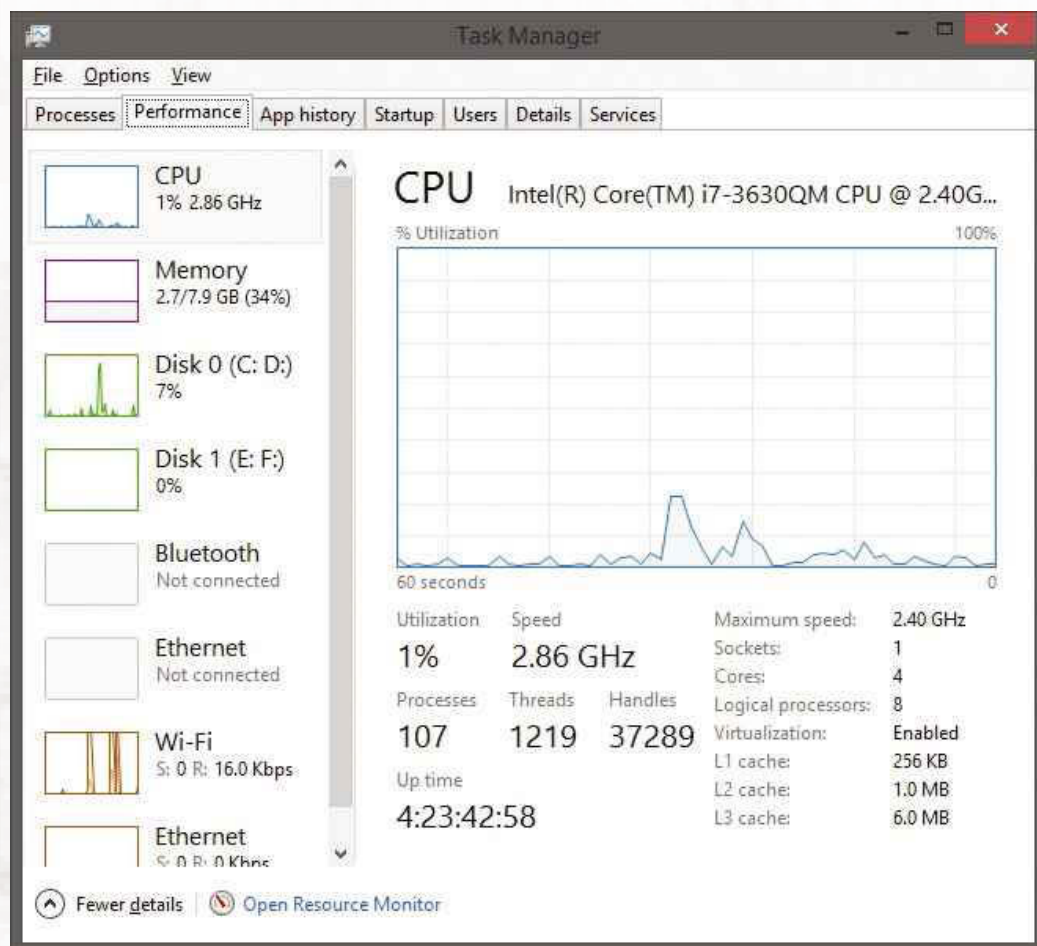
cannot make use of multiple cores and only runs on a single one, will it actually run slower on a 1.5GHz CPU quad-core than it would on a 2GHz dual-core? Yes, probably, as each individual core on the quad-core model is slower than the dual-core, so if a program uses only one, it'll have a slower CPU speed to work with. This means that users who run a lot of older programs may actually benefit from running an older CPU, as this will often result in better performance.

This is the major side-effect of the evolution of the CPU. Multiple cores came from both a technical limitation, as we explained earlier, and also from

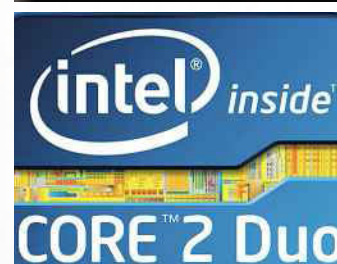
a need for more computing power in high-end servers. Network servers usually run a wide range of programs all at once and serve large numbers of workstations. This necessitates the need for faster processing of more programs at once, hence the suitability of multiple cores. And as server software is specialised for this task, it's almost always written to make use of this tech. Home PCs have embraced multiple-cores for many years now, but a lot of software still fails to make proper use of this.

Clocking On

Although PC performance isn't as heavily reliant on numbers



▲ You can see CPU threads in the Task Manager



these days, clock speeds are still an important specification, and higher clock speeds are still faster than lower. The difference with multi-core CPUs is the fact that each core runs at this base speed, and this needs to be taken into account.

Now it's not as simple as adding all core speeds up into one large, mega score; that's not how it works. Instead, it simply means that each core can handle programs at its speed, with the other cores doing the same. That core speed isn't hacked up as much between programs as it would be with a single, faster core.

The main reason multiple-core CPUs often run at slower core clock speeds than models with fewer cores is thermal restrictions. Simply, the higher the clock speed, the hotter the CPU, and because multi-core CPUs have multiple cores running at their own clock speeds, if they were any faster, overheating would become a serious problem.

As with threading, core speeds and their benefits vary, with the two being interconnected. Just as multiple threads can enhance multitasking, so too can multiple cores with higher clock speeds. If a program supports multi-core CPUs, it'll be able to make use of multiple cores, each running at that clock speed. Programs that can't do this will be limited to a single-core and that clock speed.

So a compatible program running on a 2GHz quad-core CPU will make use of all cores and the full, combined speed. A program that can't will only use one 2GHz core, meaning that a 3GHz dual-core model will suit better, as the cores run faster on their own.

What's Your Poison?

It's common for many users to notice this variance in speeds, often noting that older CPUs appear to be running faster than more up to date models that feature multiple cores, and

in almost all situations, it's the reasons we've explored here that cause that. At the end of the day, the performance you get out of a processor depends on what you put into it and what you actually use your PC for. This is because programs boast assorted needs and can make use of different specifications.

Let's look at a few, starting with the prime example in the home and that's gaming. Games are very complex programs, with many layers of specialised code and functions running at once. There's the visual rendering, audio, game engine, artificial intelligence and much more, all being processed and run in real time. This takes a lot of processing muscle, and it's here where multiple cores come in very handy. Now that games are able to separate tasks, delegating them to dedicated cores, it means they can run more efficiently and, technically, more can be done. With the arrival of CPUs that can also take on some processing usually handled by the graphics card and vice versa, this is even more applicable.

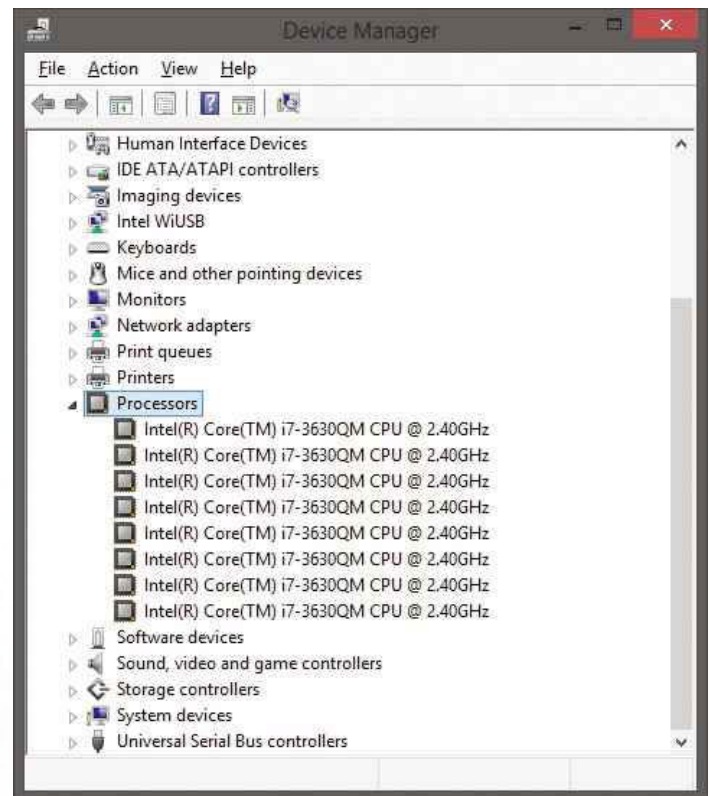
Games are often developed to make use of multiple cores and are a great example of where the technology really comes into its own, but gaming isn't the only use for multiple cores in the home and actually doesn't make the most use of multiple cores. This falls to a couple of other tasks: video editing and 3D rendering.

Video editing is a major focus for multi-core CPUs, as this is a task that requires a lot of heavy duty processing, and the majority of decent video editing tools make full use of multiple cores and threads, greatly improving the PC's editing capabilities and making it a far more viable task to perform in the home. Would YouTube have become so big, so quickly if not for the processing power of multi-

core CPUs? Maybe not. Just try comparing video rendering times between a single- and multiple-core CPU to see what we mean.

Likewise, 3D rendering is another task that can push a CPU to its limits, as a huge amount of data is handled for

each and every frame of the process. Even CG movie studios like Pixar, with its enormous and powerful render farms, can take days just to render a couple of minutes of film, so having multiple CPU cores helps greatly and can speed up the task. [mm](#)



▲ Device Manager may show eight CPU cores, but it could be Hyper-Threading

In Conclusion

Now that we understand a little more how multiple-core CPUs work and the differences they bring to the mix, can we say which is best and if multiple cores are better than one? Yes, we can – for the most part.

Multiple-cores are, in most circumstances, the better option, as they allow more efficient handling of data and grant the most power thanks to more than one CPU core, even if each core is technically slower than a single or even double core. Programs that can handle multiple-cores and make use of multiple threads will always run faster on these types of CPU, and modern PC hardware really does benefit from more up-to-date CPUs.

If you're running a lot of older software, however, or your PC is older, a multi-core CPU may not actually be as fast as it would be with an older, single- or dual-core system, because the programs you'll be using just can't make full use of the new tech, and those extra cores and multiple threads will be wasted or even contribute to slower performance than normal.

So as is the case a lot of the time, it all comes down to your own PC use, and you need to pick the best option. Now that you know more about multiple cores and their details, you should be better armed to make this decision.

Phillips 274E5 Monitor

Michael Fereday feasts his eyes on a Philips monitor

DETAILS

- Price: £209
- Manufacturer: Philips
- Website: www.philips.com



The first two characters of the Philips 274E5's model number give the clue that this is a 27" monitor. With a thin black bezel, the LCD monitor offers an effective viewing area of 597.89 by 336.31mm with an aspect ratio of 16:9 and an optimum resolution of 1920 x 1080 pixels at 60Hz.

The monitor panel needs to be mounted on the supplied black stand using a screw located as part of the oval base, and this monitor doesn't possess swivel or height adjustment features, so you're limited to landscape orientation with the screen's height fixed at 10cm above the workspace. The only adjustment you can make to positioning is the ability to tilt the screen between -5 and 20 degrees. This isn't a deal-

breaker, though, especially for a monitor of this price.

Positioned on the rear of the monitor are connections for HDMI, DVI, VGA, headphones and audio plus mains power. Leads are provided for VGA, audio and a two-piece AC/DC power adapter.

Following the usual pattern, the monitor's controls are located below the bottom-right corner of the bezel. While some of these buttons, such as the on/off control, have a single function, others change their functionality

to reflect the current mode set from the OSD (on-screen display).

The particular model under review features SmartImage Lite. This is proprietary technology developed by Philips and has been designed to analyse the content displayed on the screen. The information gained from the analysis will be used to dynamically adjust various features of the display to give a better performance. How exactly this works isn't evident, but we were impressed with the results.

SmartImage Lite technology has three different modes. These are designated as Standard, Internet and Game. Depending on the chosen mode, the areas targeted for adjustments will vary. In the case of Standard mode, text will be enhanced while brightness should be dampened. Contrast, colour saturation and sharpness enhancements fall under the remit of Internet mode. An overdrive feature will be activated with Game mode. This will attempt to produce a better response time and cut

down on the jagged edges of fast moving objects.

This Philips monitor also supports Mobile High-Definition Link (MHL), which allows you to set up a direct connection between a mobile phone or other portable device and the monitor in order to display the mobile content on the high-definition screen. This feature requires the presence of a special MHL lead and a MHL-certified mobile device with the connection made via the HDMI option. Assuming you have everything required, this is a useful function to have and is great for things like viewing photos and videos, among other things.

As part of the supplied software, you get a copy of SmartControl Lite, which allows you to manually adjust features of the display. The areas covered have been categorised as Adjust, Colour, Settings and Help. A list of options, with tools such as slider bars and navigation arrows, will appear as each category is selected.

Is this the best 27" monitor on the market right now? Probably not, but for the price, it's a pretty good option.

mm Michael Fereday

Key Specifications

- **Monitor Panel Type:** IPS LCD Backlight LED
- **Panel Size:** 27" W (68.6cm)
- **Aspect Ratio:** 16:9
- **Pixel Pitch:** 0.3114 x 0.3114 mm
- **Brightness:** 250 cd/m²
- **SmartContrast:** 20,000:1
- **Contrast Ratio (typ.):** 1000:1
- **Response Time (typ.):** 14ms
- **SmartRespons:** 5ms
- **Optimum Resolution:** 1920x1080@60Hz
- **Viewing Angle:** 178° (H) / 178° (V) @ C/R > 10
- **Picture Enhancement:** SmartImage Lite
- **Display Colours:** 16.7M
- **Vertical Refresh Rate:** 56Hz - 76Hz
- **Horizontal Frequency:** 30kHz - 83kHz
- **MHL:** 1080P@30Hz
- **sRGB:** Yes

A monitor that offers good value



RaspyPlay4

At last, high-quality audio for the Raspberry Pi, in a single neat add-on

DETAILS

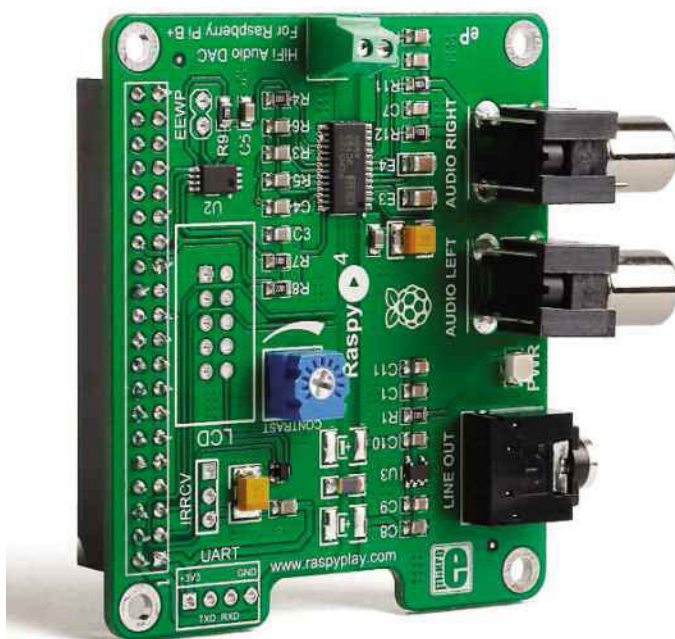
- Price: \$39 - ~£26
- Manufacturer: MikroElektronika/Eurogenyx
- Website: goo.gl/mWg8Nc
- Required spec: Raspberry Pi Model B+ or Raspberry Pi 2, ideally RuneAudio image or Volumio image

With the launch of the new version of the Raspberry Pi, the attention of the media and hobbyist community is once again focused on this rather remarkable little board of ingenuity. The extra processing power of the Raspberry Pi 2 Model B has probably shifted a fair few units off the shelves of warehouses across the globe by now. And why not? It is, after all, an exceptional learning foundation for electronics and programming projects.

Unfortunately, despite the advances in the processing power, the extra memory and so on, among the purists there remains an issue with the playback of decent digital audio. Now, however, that issue appears to have been addressed.

The RaspyPlay4 is an innovative add-on board that connects directly to the Raspberry Pi – the model B+ onward – via the 40-pin GPIO header. You can access the RaspyPlay4 through the IQaudio Pi-DAC driver by updating the DAC kernel modules in Raspbian, or you can simply download and use the latest version of RuneAudio for the Raspberry Pi, which will give you immediate access to the new hardware.

The RaspyPlay4 features two standard RCA stereo ports and a line-out for connection to



headphones and other audio equipment, but it also has connectors for an IR receiver and an LCD (with the male pin headers included in the package), thus making the Pi a formidable audio station and server.

The audio is handled by a PCM5122 DAC, which provides high-quality audio without any electromagnetic interference, and can offer a dynamic range of 112dB with a sampling frequency from 8KHz through

to 384KHz. There's even a hardware volume control on the board itself.

The RaspyPlay4 is an interesting add-on board for the Raspberry Pi. It's the first hi-fi audio attachment device we've used for the Pi, and it has got us well and truly hooked, especially the project potential for creating a music station. It also seems to be a lot more functional than the competition (the HiFi Berry DAC and HiFi Berry Digi+ and

IQaudIO Pi, for example), and it's more expandable too from the point of view of a larger Raspberry Pi audio project. The only board we can tell that comes close to this kind of specification is the Cirrus Logic Audio Card for the Pi but, as we've said, we haven't used these boards yet, so we can't give a direct comparison.

Currently, the RaspyPlay4 is available through MikroElektronika at a cost of \$39, which puts it at around £26. It's a small price to pay for something that delivers such a lot and, of course, by vastly improving the audio output of the Pi.

We rather liked the RaspyPlay4. It's simple to use and to activate without having to recompile anything, and the effect that improved audio output has is very impressive. Based on that we think it'll make for an ideal addition to any Raspberry Pi enthusiast's collection of add-on boards and projects, plus it's a far neater package than some of the examples we've seen in the past when it concerns higher-quality audio on the Raspberry Pi.

mm David Hayward

Perfect for Raspberry Pi enthusiasts who demand better audio output



Corsair Hydro Series H110i GT

Corsair establishes a new high watermark for pre-built liquid cooling

DETAILS

- Price: £100.94 (Scan)
- Manufacturer: Corsair
- Website: www.corsair.com/en-gb/
- Required spec:
AMD: AM2, AM3, FM1,
FM2 or Intel LGA 1150,
1155, 1156, 1366, 2011,
2011-3 System

There was a time, not long ago, when deploying water cooling to your PC involved some plumbing skills and a few prayers to the gods of spontaneous leakage.

Thankfully, these days you can get sealed systems like the Corsair Hydro Series H110i GT that can deliver it into your system without either of those and which provide effective water-based cooling.

Corsair makes a range of these products that address both those wanting extreme cooling and others who just

need better-than-air cooling. The H110i GT replaces two of its higher-end solutions, the H110 and H100i models, providing the heavy duty cooling of the former with the features of the latter.

There are two critical parts to all water cooling systems: the radiator and the heat exchanging head. Corsair has redesigned both these parts, building on its extensive experience with previous models to guide the changes.

Of these, it's the radiator that is most impressive, now scaled to mount dual 140mm fans. Before anyone buys this equipment, they need to make sure they have room in their case for a radiator that is 322mm long, 140mm wide and 27mm deep.

Because you can't detach it from the sealed system, you can't realistically mount it externally, so it probably represents the biggest challenge of deploying this equipment.

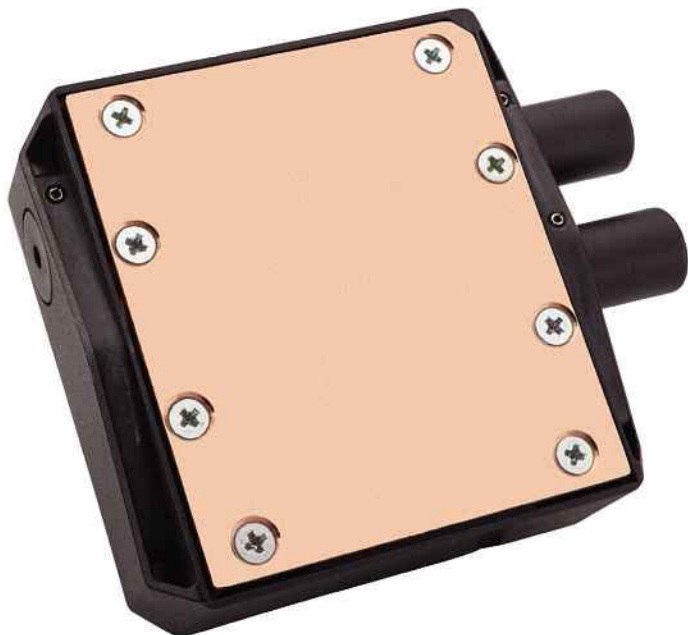
The business end of the H100i GT has also been revamped with enhanced coldplate efficiency and the introduction of 'Link integration'. That last feature previously appeared on the

H100i but was missing from the H110, so it's a logical progression to see it included in a new flagship design.

Link integration uses a USB header to link the Windows OS to the cooling system through Corsair's own Link software, allowing for dynamic control and monitoring of the cooling system. In addition to the USB header, the system needs a SATA power line to drive the pump and connecting to the three-pin CPU fan header, so the system doesn't whine about a missing critical part.

If you jump through all those hoops you'll end up with a very neat system where the CPU isn't crowded and the memory slots are more accessible than they are with many air coolers. There are more cables to tidy up than the H110, but the functionality those provide makes them almost certainly worth dealing with.

But this gear is all about cooling, and I have slightly



“One of the best solutions available that doesn’t involve creating your own”

mixed feelings about what the H110i GT offers in that respect.

Don’t get me wrong, this is an excellent cooler and is perfectly capable of taking a heavily overclocked and over-volted CPU back to a realistic operating temperature (63-67C). My major concern is that unless you intend to fork out for a Core i7 4970K and then rag it like a boy racer’s XR2, then the H110i GT is probably overkill.

However, the upside of using it on a less aggressive configuration

is that the water pump doesn’t run at the sort of speeds where it starts to make a clearly audible rumble. That was a minor problem on the H75, and it’s still an issue with this model.

What it doesn’t negate, however, is how effective a cooler this is, even if I’m not entirely sure how many people need something so good and with such a wide scope for handling out-of-spec systems.

Cooling aside, Corsair also added lots of customisation



options, for those who want to show off their PC building skills.

The radiator and cooling head both have easily

detachable inserts that beg repainting, and there’s an LED on the head that you can now be set to a specific RGB colour from the Link software too. For these reasons, I can see the H110i GT being very popular with the modding community.

At more than £100, this isn’t a cheap option or one that will fit neatly in every case, but it does mostly what Corsair intended, critically. The cost is only expensive if you don’t intend to fully exploit the capabilities of the H110i GT, as Corsair and other brands have a wide selection of less ambitious devices.

But if you must have one of the best solutions available that doesn’t involve creating your own from scratch, then this is probably it.

mm Mark Pickavance

A monster water cooling solution for serious overclockers



	H110i GT	H110	H100i	H105
Fans Included	Dual 140mm	Dual 140mm	Dual 120mm	Dual 120mm
Fan Dimensions	140mm x 140mm x 25mm	140mm x 140mm x 24mm	120mm x 120mm x 25mm	120mm x 120mm x 25mm
Radiator Dimensions	140mm x 322mm x 27mm	140mm x 312mm x 29mm	120mm x 275mm x 27mm	120mm x 272.5mm x 38mm
Cold Plate	Copper	Copper	Copper	Copper
Corsair Link Compatible	Yes	No	Yes	No
Selectable Fan Profiles	Yes	No	Yes	Yes



Zotac GeForce GTX 960 AMP! Edition

Zotac pimps Nvidia's latest GPU for some AMP-level performance

DETAILS

- Price: £174.99
- Manufacturer: Zotac
- Website: www.zotac.com
- Required spec: PCIe x16 slot, Windows 8/7/Vista or XP

Like Microsoft has with Windows 10, Nvidia decided to leapfrog a series number and jump from the Kepler-based 700 cards to the new Maxwell powered 900 series.

At this time, they don't include any low-end cards, so the minimum specification ones are the GTX 960 cards that start at about £165, rising to more than £200.

The Zotac GeForce GTX 960 AMP! is a pre-tweaked design that costs only marginally more than a stock item, but comes with some highly desirable enhancements.

The first of these you notice unpacking the card is the very stylish and elegant dual fan 'IceStorm' cooler tech that Zotac has enclosed in a beautifully made 'ExoArmor' shroud.

In this context, looking good and working great are indeed

the same thing, as the fans don't run continually even when you're in 3D mode. When using the 2D desktop, it's normal to see one or even both fans spin to a stop, before kicking back into action once you demand more video performance.

It doesn't take much testing to confirm that this card is substantially better than the GTX 760 it replaces. However, what I found most remarkable was how power efficient this card is, helping it stay cool

and quiet even under some gaming duress.

On paper, there is plenty to rave about under this GPU bonnet. The Maxwell GM206 GPU core has nearly three billion transistors packed into a 228mm square, supporting 1,024 unified shaders, 32 ROPs and 64 TMUs. Wired to the GPU are 2GB of GDDR5 through a 128-bit bus, providing a healthy 112.2GB/s of bandwidth.

These levels are true for all GTX 960 cards, but the Zotac AMP! branded cards always deliver a notch above and beyond stock settings.

The GPU core clock is raised from 1127MHz to 1266MHz, and it will boost to 1329MHz more than 100MHz above the usual cap. That increases both pixel and texture fillrate by about 10%. Memory is stock speed at 1753MHz, giving a quad-pumped equivalent of over 7GHz for the GDDR5 memory.

I couldn't help be even more impressed by these



“ There is plenty to
rave about under this GPU
bonnet ”

Technical Specification:

GPU: Nvidia GeForce GTX 960 GPU (Maxwell GM206).

Cores: 1024 CUDA.

Engine Clock: base/1266 MHz boost/1329MHz.

Memory: 2GB DDR5 memory, 128-bit memory bus.

Memory clock: 7010MHz.

PCI Express 3.0 x16.

Connections: 3 x DisplayPort 1.2 (4k @ 60Hz), HDMI 2.0 (4k @ 60Hz), Dual-link DVI (2560x1600), quad simultaneous display capable.

Power: 400W PSU recommended, 120W max power consumption, single six-pin PCIe power line.

Size: 208mm x 111.15mm, dual slot width.



specifications when I realised that the GTX 960 only requires a single six-pin PCI power line and a very modest 400W PSU.

Another strong point is the outputs, as it has five of them, of which you can choose four to simultaneously use. They include three full-size Display Port, HDMI and a DVI that you could easily subvert for D-sub VGA with an adapter.

After initially missing AMD's Eyefinity tricks, Nvidia is clearly now firing on all cylinders with its own multi-display technology. There is enough power in this GTX 960 to drive a game on triple screens, if you back the detail settings off a little. And the results can be spectacular especially on driving titles.

I should also mention that although it's inherent in modern

Nvidia cards, this card is also PhysX and CUDA capable, along with all its Direct X 11.2 and OpenGL 4.4 powers. The only problem I ran into with this was that automated PhysX selection didn't appear to work on older titles like *Batman: Arkham Asylum*.

The internet is full of benchmarks for these cards, so I restricted myself just to 3DMark for a comparison with other recent designs. On my Sabertooth X79 test rig I managed a Fire Strike score of 6900 and a Fire Strike Extreme of 3451. That's within 10% of GTX 780 levels and 25% better than AMD R9 270. As the latter typically costs £125, the GTX 960 is certainly worth the difference.

If there is a real blot on this finely crafted landscape, then it's the very competitively priced AMD R9 280 and 285 cards that you can now pick up for less than £150.

These cards are just a tiny bit quicker, though they're not nearly as power efficient, requiring dual six-pin power lines to operate.

The physical size, low power demands and high construction

quality of the Zotac GeForce GTX 960 AMP! Edition makes it an excellent option for any gamer wanting to build a powerful rig without needing to deploy a huge case or PSU.

Compared with other brands shipping their tweaked GTX 960 designs, Zotac's is also very keenly priced, being cheaper than some stock rated designs.

Unless the cost is out of your budget range, this card offers great performance that only a couple of years ago would have cost you £275 or more.

mm Mark Pickavance

A beautifully made card that most gamers will adore



Cities: Skylines

Kevin Pocock loves to grow cities. He just didn't know it

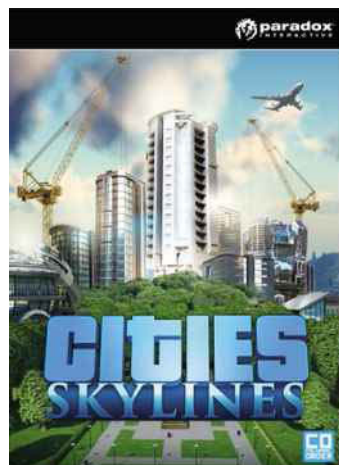
DETAILS

- Price: £22.00
- Developer: Paradox Interactive
- Website: goo.gl/1A11BM
- Required spec: Core i5-3470T 2.8GHz or later/equivalent, 6GB RAM, GeForce GTX 660 or later, Direct X 11, 4GB disk space, Windows Vista or later

Probably one of the biggest compliments any gamer can give is to admit being turned from cynic to believer. And having spent just a few days with Cities: Skylines, I've travelled a somewhat similar journey. Uninspired having installed the title – and with a first couple of disastrous attempts doing little to win me over – I could barely have been more apathetic. I'm not a huge fan of simulators, and when it comes to city games I'm far more a GTA addict than a supporter of Sim City.

Yet there's a simple alluring logic to Cities: Skylines, Paradox Interactive's city-building masterpiece. It's a logic, married with rewarding task completion, unlocking and achieving milestones, which fosters a proud attentiveness in your role as mayor. You care about your land, you care about building the best city you can. And, with a beautiful set of visuals to bring to life a growing creation, you care that the title is both genuinely challenging and subtly seductive.

Starting with a choice of maps and land-types, you're introduced to a visually appealing landscape populated by trees, rivers and seas. These lush lands are ripe for 21st century developmental dreams to be put into action. Your first task is to connect your new settlement to an



existing motorway, laying initial roadways. Water and electricity infrastructures are then the immediate tasks, as you seek to zone residential, industrial and commercial areas while ensuring each has a healthy supply of utilities. Structure Creation is mesmerising. You set zones (or single plots for specific structures) and can then zoom in to watch buildings morph majestically. They grow from foundations, to skeletons, to fully functioning places of work, residence or retail. A word of warning: it's easy to fail even before this point, because your main source of early income is taxes. Overstretch yourself without making room for citizens, industry and shops and no taxes are paid. Therefore no income is available and you're left with empty roads and unused water and power.

It's also at this early stage that you are (rather brilliantly) coerced into a subconscious set of ideals about what your city will stand for. Whether you can stick to, for example, green energy in a thriving metropolis is one of an enormous amount of challenges Cities: Skylines will throw at you. More immediately, you should provide essential services. And you will care about doing so. Education, emergency



services, transport systems, refuse collection, the broader economy and the question of tourism. I found myself investing in all of these as I watched my city grow. And I certainly revelled in the ultimate happiness of my citizens.

Upgrades to existing infrastructures, new buildings, policies and even land can be acquired as your progress. You can provide more efficient power and roadways, and enhance the quality of your citizens' lives in all manner of ways. Of course, you can take loans, tweak and change the economy, and even effect policies on drugs, smoking bans, recycling and parks. All manner of city-building aspects are handled just spectacularly. Really, the depth of control and gameplay is as gloriously praiseworthy as the lands the Unity engine delivers.

Yet the issue will be whether you have the time to dedicate to it. With much to master, varied landscapes and even

downloadable content, I found myself admitting to my girlfriend I was scared. Scared because I was enjoying solving power problems. I cared about town-planning, and I never thought I would. Scared because I thought I knew myself, and really Cities: Skylines has proved otherwise. In all honesty, perhaps that's the best compliment I can give.

mm Kevin Pocock

Surprisingly good city sim. And really quite addictive



Vodafone Smart Tab 4G

Vodafone banishes tethering for low-cost Android tablet fans

DETAILS

- Price: £125 PAYG or £29 with a £17 monthly contract
- Manufacturer: Vodafone
- Website: shop.vodafone.co.uk

Occasionally, I travel down to London by train, and often I take my Nexus 10 tablet with me. Using it involves tethering it to my phone, reducing dramatically the battery life of that device.

The solution, as well presented by the Vodafone Smart Tab 4G, is to have a tablet with its own mobile communications and by definition its own mobile SIM.

But before we go there, I was curious to see what sort of tablet Vodafone would sell you for £125 and how it might compare with devices at a similar price.

My initially reaction was that the Vodafone Smart Tab 4G (aka Alcatel Pop 8S) is a nice enough Android tablet, even if it doesn't quite have the wow factor of Nexus or Samsung hardware.

Under the hood is a quad-core 1.2GHz Cortex-A53,

Qualcomm MSM8916 Snapdragon 410 chipset and Adreno 306 GPU, wired to 1GB of RAM and 8GB of flash storage (4.7GB available). That sounds a good spec, and it works acceptably on Android 4.4 even if the amount of user available storage isn't great.

Thankfully, you can put a micro-SD card inside, adding up to 64GB of valuable extra space. There are two also cameras, a 2MP front facing and a 5MP rear, but no flash. Images can be geotagged by the system, as the device has A-GPS technology.

But these aren't the killer feature, that's the GSM, HSPA

and LTE capable mobile phone electronics that allow you to get data while on the move.

It also allows you to receive text messages, if you hand out the number of the SIM you use in it. But (and this sort of blew my mind) it won't receive calls.

You can ring the number, and it rings, but it goes through to voicemail, and the tablet never mentions the call or the message. That seems remarkably unhelpful, given that most Samsung phablets will work as a phone too.

That was one disappointment, and the other was Vodafone's addiction to crapware, and this machine contains numerous examples, some of which are uninstalleable.

Given a machine with such limited capacity, to clog it up with apps the user may never want is unforgivable really.

Despite those points, the Vodafone Smart Tab 4G is still a cheap means to get mobile internet without tethering, for which there are almost no competitors.

And, I've concluded, there is a good reason for that, because

the combination of a cheap tablet and 4G LTE services makes as much sense as a Dacia that runs on plutonium. As it's possible to burn through Vodafone's minimum PAYG £15 2GB monthly data package in under five minutes with LTE.

If you can't afford a better tablet, then you probably can't afford the LTE mobile data costs that justify having this specific one.

Take that one feature out of the equation and this is a very average tablet that costs roughly what it should for the feature set.

mm Mark Pickavance

An unusually cheap tablet with LTE

Technical Specification:

OS: Android OS, v4.4.x (KitKat)
Chipset: Qualcomm MSM8916 Snapdragon 410
CPU: Quad-core 1.2GHz Cortex-A53
GPU: Adreno 306
RAM: 1GB
Storage: 8GB (4.7GB usable)
Display: IPS LCD capacitive touchscreen 720 x 1280
Cameras: 5MP rear and 2MP front
Battery: 4060mAh non-removable
Mobile: GSM / HSPA / LTE



GROUP TEST

Headsets

Having a headset doesn't just mean that you're a dedicated gamer or someone who does YouTube walkthroughs and voice overs. There are plenty of other reasons where a good headset comes in handy.

Skype, Google Voice Chat and other such voice chat clients all require a decent microphone, so rather than having two separate systems in place, a headset is ideal.

David Hayward dons a selection upon his furrowed brow, turns up his hearing aid and tries to work out which sound the best.

Headsets

Tesoro Kuven Pro 5.1 Headset

DETAILS

- Price: £82
- Manufacturer: Tesoro
- Website: goo.gl/n9ikrx
- Required spec: Spare USB port, Windows XP or later

Tesoro has quite the gaming fan base behind it these days, since it started to ship its products over to the UK. Its selection of keyboards, mice and other such peripherals are impressive, to say the least, but they're nothing compared to the selection of headsets on offer.

This particular model, the Tesoro Kuven Pro 5.1 – Kuven being the name of the helmet worn by Hades – has a list of specifications that would make even the most cynical audiophile sit up and take notice.

For starters, it's a remarkably comfortable headset. The leather covered ear cups are filled with memory foam, making the contact with the ear extremely comfortable and greatly improving the noise cancelling properties. Each cup too can pivot and rotate, giving the best feel to every shaped head they'll eventually sit on.

The adjustable headband is similarly padded with the memory foam and is presented in such a way as to be pleasing to the eye. The ear cups, for example, have Tesoro emblazoned metal plates, and purple LEDs light up the headset in a rather pleasing effect.

However, it's not just the special effects that make this an alluring headset. Each ear cup houses four drivers that output the channels, which



make a 5.1 surround setup. The voice, front, rear, centre and sub drivers all work in harmony to produce a clear and high-quality audio output, which is surprising, as you would expect a cacophony of mixed sounds, having this many drivers in such close proximity. Tesoro has worked out the technical aspects of it, though, and it's quite impressive.

The attached microphone is good too, with suitable noise and environmental cancelling. You can also fold it up, out of the way, for when you just want to listen, and it's not located too far away from your mouth so you're not tempted to shout in order to have it pick up your voice.

Furthermore, the headset is connected to a desktop controller using a custom Tesoro connection. This desktop controller is one of the most comprehensive and advanced headset control systems we've ever come across. With a selection of buttons, which allow you to cycle through the drivers in the ear cups and the mic, and a large volume dial, you can tweak the performance and levels to suit your needs.

It's quite a simple setup and very easy to get to grips with once you know what each of the buttons does to affect the output. Generally, you'll tend to leave it alone when you have it set to your requirements, but pushing a button and turning the dial isn't too much of a chore.

The Tesoro Kuven Pro 5.1 sounds great, is very comfortable and has a range of impressive features to its credit. But this level of audio technology comes at a price – around £82 to be exact, which makes it the highest priced headset in this group.

While expensive, though, it's a fantastic headset. If it's quality, both in design and audio output, that you're after, then this is a headset you should certainly save up for.



Roccat Kave XTD Headset

DETAILS

- Price: £60
- Manufacturer: Roccat
- Website: goo.gl/ppYPWZ
- Required spec: Any system with spare 3.5mm

Roccat has been making some incredible gaming and performance system peripherals for a number of years, and it's a company that's very good at doing that. Like Tesoro, the line-up of keyboard and mice are mouth-watering, but again it's the headsets that take centre stage.

The Roccat Kave XTD is one of three Kave products; this is the stereo headset version, with the 5.1 and military versions offering a little more in terms of style and substance. But that doesn't mean the XTD stereo set here isn't any good.

The design is appealing, with well-padded ear cups that fit comfortably but don't cancel out environmental noises quite as well as would be expected. The headband is also reasonably comfortable but lacks the upholstered look and feel that many other higher-end headsets have to

offer. The foam on the underside of the headband is okay and is just as robust as the competition.

The 50mm neodymium drivers do a good job of dishing out a fairly decent level of audio quality. There's clear, crisp sound from the headphones, but it's sadly lacking in a good throaty bass, although not enough to make the other frequencies sound too tinny.

The microphone is very good and does an excellent job of cancelling out any background noise, and it produces a clear voice that

stands out from the other noises being squeezed through the drivers.

There's a decent length cable here, measuring two and half metres and terminating in a pair of 3.5mm jacks – one for the headphones, the other for the microphone – which means it's not just a PC device. There's also an in-line control with basic volume and mic mute, and a clip to fasten it to your shirt.

We did find the Kave to be quite a rigid and stiff headset, though. While this isn't too much of an issue when using them and static, if you were carrying them around there's a good chance they may get damaged when thrown into a bag with other heavier items. Perhaps if Roccat included a heavy duty, protective carry case, we wouldn't feel too worried about transporting them around?

Overall, though, the Roccat Kave XTD is a good gaming orientated headset. The sound quality is good, and it is reasonably comfortable, but we were expecting a little

more from Roccat. For a headset that costs somewhere in the region of £60, there seems to be a lot that could have been added in terms of both design and audio quality. And as you'll see in the coming reviews, there are far better and more feature laden headsets for considerably less.

Perhaps it's because these are the little brother to the 5.1 and Military Grade specification Kaves that they lack the punch of the more capable in the product line? Either way, the Roccat Kave XTD is a good headset, just not great.



Headsets

Turtle Beach Earforce Z22 Gaming Headset

DETAILS

- Price: £22.97
- Manufacturer: Turtle Beach
- Website: goo.gl/ROPGdg
- Required spec: Spare USB or 3.5mm ports

Turtle Beach has been around for seems like decades now. In fact, the company has over 35 years of experience in the audio industry, in one form or another, so it's a company that certainly knows what it's doing.

The headset on test here is a Turtle Beach Earforce Z22 gaming headset, a well crafted and very comfortable set of headphones with a more classically designed microphone.

The headset has a mesh, foam filled headband, with a leather upper that's stitched to the frame of the headband. The ear cups are adjustable for maximum comfort and also feature the same kind of foam-filled mesh that's fitted to a sturdy outer cup. The overall effect is one of extreme comfort, especially when used over time. The fabric is certainly soft enough for longer sessions of gaming or just listening to music, and the weight is nicely balanced too, feeling reasonably light but not flimsy.

The microphone section is long and flexible enough to move around to what suits the user best and features a rather natty, retro-looking lump of speaker foam on the end. Regardless of that, it performed extremely well and, as an added bonus, you can have the sound from the mic fed

back through the headphones – something that we're told is handy when you're doing YouTube game walkthroughs and such.

The sound quality through the headphones is excellent but is further improved through the use of the in-line controls that terminate in a 3.5mm port for connectivity to USB and power. The in-line control box allows you fine tune the bass, treble, headphone volume, microphone sensitivity, as well as an instant mute for both the headphones or microphone. There's even an option to fit your phone, so you can take calls when wearing the headset.

The control levels are good, but perhaps not quite as good as the Tesoro Kuyen. However, they're generally enough to offer the user a higher degree of control over the sound than most other setups.

The biggest selling point of the Turtle Beach Z22 gaming headset, however, is the price. At around £22.97, these are exceptionally good value and deliver a much higher quality of build, features and audio technology than most of the other examples available on the shelves. That alone puts the Earforce Z22 above the rest in our books.

The only detail we didn't like was the length of the USB cable from the in-line control back to the back or front of the PC. We felt that at around a metre and half, it was just a little too short, particularly for our setup.

Obviously this isn't going to be an issue for most users, so it shouldn't be something to mark the Earforce down on. Overall, then, the Turtle Beach Earforce Z22 gaming headset is a comfortable, excellently sounding and very capable headset that's ideal for



gaming, as well as enjoying great PC audio through a superb set of headphones.



Corsair Raptor HS30 2.0 Gaming Headset

DETAILS

- Price: £29.99
- Manufacturer: Corsair
- Website: goo.gl/jg5F6v
- Required spec: Spare 3.5mm audio sockets

Corsair isn't a company that immediately springs to mind when think of headsets – SSDs, yes, but headsets, gaming or otherwise, usually no.

However, the Corsair Raptor HS30 2.0 is the product of a range refresh with value for money in mind, along with some good use of headphone technologies.

The red and black colour scheme is quite eye-catching, as is the piano-black, polished outer plastic of the headband. The inner side of the headband has a red, leathery feel, foam padding that's reasonably comfortable, but not quite as splendid feeling as the Turtle Beach headset.

The ear cups also have a maroon on black colour scheme, with the over-ear cups themselves being foam padded and hiding a set of 40mm neodymium drivers.

The microphone is made of a hard, non-flexible plastic, and although it features a noise-cancelling technology and it's quite sensitive, it would be nice to be able to bring it closer to your mouth. It can be pushed up and out of the way when not in use, and the movement is

fluid and sturdy enough without feeling like you're about to break something.

Despite the design of the HS30, though, it didn't feel quite as high quality as the previous few headsets we've reviewed for this group; especially the aforementioned Turtle Beach. It was a comfortable enough headset, but we did find it getting a little too uncomfortable after an hour or so of use, and we did feel that our ears were getting a little sweaty as well.

The sound quality, however, was good, on par with the Roccat model at least. The

in-line controls didn't offer much other than volume levels and the ability to mute the microphone, but we did like the fact that the HS30 terminated in a pair of 3.5mm jacks, as opposed to USB, which can obviously be used on any system instead of just a PC.

Although good sound quality, the HS30 did lack some of the bass punch that the Turtle Beach and the Tesoro headsets delivered. The mid-range, voice and higher frequencies were generally good, but without the weighty boom of a good bass, they were left feeling a little tinny in comparison.

The comparison in this case is due to the price of the Corsair Raptor HS30. At around £29.99, it's competing with the Turtle Beach headset, and the unsuspecting customer would probably consider choosing the Corsair over the Turtle Beach for just £7 more or thereabouts. In

truth, the cheaper headset here is the far better of the two.

While the Corsair HS30 is a good headset and one would be perfectly happy to have them, they aren't as good as the other sub-£30 set from Turtle Beach. But personal tastes differ and while not as good in our mind, they are a good headset that deliver some decent features to the gamer or someone who just wants a handy 3.5mm jack set of headphones.



“ Although good sound quality, the HS30 did lack some of the bass punch ”



Headsets

Razer Kraken 7.1 Headset

DETAILS

- Price: £79.99
- Manufacturer: Razer
- Website: goo.gl/CULPc8
- Required spec: Spare USB port, Windows XP or later

Razer much like Roccat and Tesoro, is a company that produces some pretty impressive-looking peripherals. And as the other two companies have proved in the past, there's a higher standard than normal expected from anything that leaves its warehouse.

The Razer Kraken 7.1 is a headset that has undergone a facelift and has been down the peripheral equivalent of the local gym. Where the Kraken Pro offered good stereo output, this model, as you can probably tell from the name, brandishes an impressive 7.1 weapon to poke into your ear canals.

This optimised headset offers a virtual 7.1 surround sound engine through the large 40mm drivers, which deliver a good level of bass, mid-range and a perfectly clear voice without any screeching or ear-splitting whistles. Also, these are without a doubt one of the

loudest headsets we've ever used. Even with the volume set to a modest 25% we were beginning to wince at the levels being outputted from the ear cups; anything more than that would simply be unbearable and probably quite dangerous too. A word of warning, then: check your volume level before you put these on and hit the play button.

In terms of design, the headband is fully adjustable and equally cushioned,

allowing the user to wear the Kraken for a significant amount of time without any discomfort. The leather-effect, foam-filled ear cups also do an excellent job of cancelling out any environmental noises and fit the ear snugly without the feeling that they'll get sweaty after a while.

In an interesting design addition, Razer has decided to fit the microphone into a recessed slot in the left ear pod. So all you need to do is pull the flexible microphone out from its allotted place and turn it your desired position. And when done, you just poke it back into the ear cup again, which neaten things up considerably and lessens the chance of breaking the microphone off when transporting the headset around.

These are USB connected headphones, though, so you'll only be able to use them on a PC. It's not a huge issue as there are a couple of USB-

driven headsets already in this group, but it does limit the use of the headset, and those who are USB-challenged in some way or another will have to factor in the cost of a USB hub or something.

Furthermore, while we're on the subject of cost, these are the second most expensive headphones in the group, costing around £80. While good, and very capable, and offering that alluring 7.1 virtual surround sound, it's questionable as to whether they're worth quite this much to begin with.

Still, the quality of the Razer Kraken 7.1 headset is really very good, and there's a lot to be happy about with this headset. However, as we've already seen, you don't need to spend the better part of a hundred pound to get an exceptional headset.



Creative HS-720 USB Headset

DETAILS

- Price: £29.99
- Manufacturer: Creative
- Website: goo.gl/Fcc2nF
- Required spec: Spare USB port, Windows XP9, Mac OS X

Creative's long and illustrious history in the PC audio industry goes without saying, so you would expect that a headset from such a company would be able to deliver the goods to a finer degree than the competition, wouldn't you?

The Creative HS-720 USB headset is a part of the Creative Chatmax range of audio gear; in fact, it's the top of the Chatmax selection of headsets and features some decent specifications.

The design, though, is rather simplistic. The flexible (to a point) headband is made from what feels like the cheapest plastic possible, under which you'll find a sparsely padded head cushion. The ear cups are equally poorly padded, and due to the 30mm neodymium driver within they aren't particularly big either.

This is a bit of a problem in terms of comfort. From the off, we found the Creative HS-720 to be a shockingly



uncomfortable headset to wear, especially after an hour or so of use. Around the ears was worse, as the padding lacked enough foam to stop the hard plastic of the outer ear cup shell from digging into our ears.

Also, there was little to no noise cancellation from the ear pods, meaning you could hear all the environmental background noise, which in turn forced you to up the volume to an uncomfortable, ear-splitting level.

The microphone section did have some good noise cancelling properties, though, and when used, with the other user having a better set of headphones on, the voice came through clear without anything from the

background leaking into the conversation. The microphone could be muted and the volume levels controlled through a basic in-line control box, complete with shirt clip. It's functional, but nothing too elaborate.

The audio quality, however, the headphones was quite dire, if we're being honest. There was little to no bass, and the mid to high frequency ranges had far too much screech and even too much static. Where we mentioned the environmental noise being heard with the headphones on, when the volume was turned up this only amplified the static and screech to a point where it sounded like an electrocuted cat.

We weren't, as you suspect, overly impressed with the Creative HS-720 USB headset. For something of this quality we did expect it to cost nothing more than £10 or £15, but for £29.99 there's a lot wrong with this headset.

Considering you can get a significantly better setup for around the same price or cheaper, there's not much to endear the Creative HS-720 to those who are after a good, all-round, comfortable yet functional headset. In short, there are a lot of other headsets available that are better in nearly every way, so we recommend you look at them instead.





Turtle Beach Earforce Z22

Despite the fact that the Turtle Beach Earforce is the cheapest headset on test, it's one of the best we've used in a long while.

There's a near perfect mix of comfort, technology, audio quality and price here. A sure fire winner.



Tesoro Kuven Pro 5.1

in contrast, the Tesoro Kuven Pro is the most expensive headset on test. The quality, features, controls, comfort and everything else all combine to make this an exceptionally good headset for the more dedicated gamer or YouTuber.

How We Tested

Each headset was hooked up to a PC and tested with the AMD Gaming Evolved Raptr Client for voice recording in-game in *Minecraft*. They were also tested with Skype and standard Microsoft recording, as well as in-game voice with *Evolve* and *H1Z1*.

We tested the headphones with various games, as above, as well as a collection of dire 80s music and some equally questionable films.

	Tesoro Kuven Pro 5.1	Roccat Kave XTD Stereo	Turtle Beach Earforce Z22	Corsair Raptor HS30 2.0	Razer Kraken 7.1	Creative HS-720 USB
Price	£82	£60	£22.97	£29.99	£79.99	£29.99
Connectivity	USB	3.5mm Jack	USB & 3.5mm	3.5mm	USB	USB
In-line Controls	Yes	Yes	Yes	Yes	Yes	Yes
Foldable	No	No	No	No	No	No
Adjustable Headband	Yes	Yes	Yes	Yes	Yes	Yes
Noise Cancelling Microphone	Yes	Yes	No	Yes	Yes	Yes
Noise Cancelling Headphones	Yes	Yes	Yes	Yes	Yes	No
Weight	365g	318g	350g	355g	340g	138g

Your Letters

The New AI

I have just been listening to the *Life Scientific* podcast of Professor Maggie Boden. She is one of the leaders if not The Leader in modern research into artificial intelligence (the other leaders presumably work for Google by now). However, I've discovered recently that there is a different sort of AI developed by Microsoft and Amazon. I call this Absolute Imbecility.

I have recently had to make an enforced change from Windows XP to Windows 7. I soon discovered that the Windows 7 search engine could theoretically find a named file on any of the many hard drives I have attached to my computer. I was very soon let down by the results offered, which were a sort of haystack in which the desired answer might be found or not.

I decided to do a test to see if the search engine could find a file that I had found by myself in about five minutes. After around half an hour the search engine offered me answers that were as unlike what I had searched for as they could be.

Then I discovered a much greater level of imbecility in Amazon. Some time ago I bought an MP3 player from Amazon that worked better (for me) than any of the Sansa Clip players. I use the MP3 player with a pair of computer speakers to play stories and other audio material beside my bed to help me to sleep. Sadly, although the Sansa players are

very good, they do not give out a big enough audio signal to drive the speakers at the volume I require.

The MP3 player I had bought was a lot cheaper than any Sansa clip, but provided a signal strong enough to drive my speakers. So, a few days ago, I decided to get another one from Amazon. A search for MP3 player in the general mode provided dozens of iPods, iPod copies, and Sansa Clips in a multitude of colours. Many of the offerings were of different colours at the same and different prices for electronically identical devices. As the player I was looking for was much cheaper than a Sansa Clip I tried a search from low to high. Amazon limits such a search to 400 pages. I discovered having seen all 400 pages in the low to high search that NONE of the items shown was an MP3 player. Is this a record for a search engine that offers anything but what one is looking for? The most commonly offered items were 'Bullet' connectors that plug into a car's cigar lighter socket for a number of different smart phones. There were at least 1,000 of these connectors listed in every possible colour for dozens of different models of smart phones.

I rate Amazon's search as being the most Absolutely Imbecilic with Windows 7 file-search a close second. Do the readers of *Micro Mart* know of comparable AI examples?

Wilf James BSc.



Pop Go The Windows

Is it just me or are other people getting fed up of what seems like all software going over to the 'flattened' type of user interface. Firstly iOS/Office 2013. Followed on my Mac OS X and almost every software package that I own, including online banking. I find it awful to look at and difficult to find what I want to click on at times. Subsequently, I have reverted back to office 2010 from just not liking the interface.

I can see why software developers are doing this as it saves processing time, but now we have very fast processors this isn't an issue. We've seen computers go from DOS based systems to Windows and then each version of windows looking nicer (except Windows 8). Then we get a sudden reversal of everything we've come to like.

I use both windows (8.1, I find it okay) and MAC OS. I refuse to 'upgrade' MAC OS to Yosemite as I don't want that user interface. I think that if this is the way that the user interfaces are going then there

needs to be an option for the user to either go with a 3D or flattened look. This needs to be at the operating system level so that the user doesn't have to select the type of interface on each program.

I started this rant after all the software that I own now moving to the flattened interface after the latest update.

Peter Pinner

GET IN TOUCH...

By email

letters@micromart.co.uk

By post

Micro Mart
30 Cleveland Street
London
W1T 4JD

Online

forum.micromart.co.uk



The Download Directory

tinyurl.com/or7f238

James Hunt scours the internet for the best freeware, shareware and paid-for application releases

Welcome again to the latest instalment of The Download Directory. This month's applications include: FixWin, a troubleshooting application for Windows 8; Pixopedia, a freeware Adobe Photoshop rival just starting development; SepPDF, a tool for splitting up PDF files into individual pages, and Areca Backup, a freeware platform-independent file backup tool.

As well as all that, we've also got the usual look at the latest beta versions to be released in the last month to help you keep track of the new releases which are coming your way soon, and the latest instalment of our regular look back on previous Download Directory entries where we see what happened to the programs of the past and how they've improved – or not.

FixWin 2.2

Release Type: Freeware

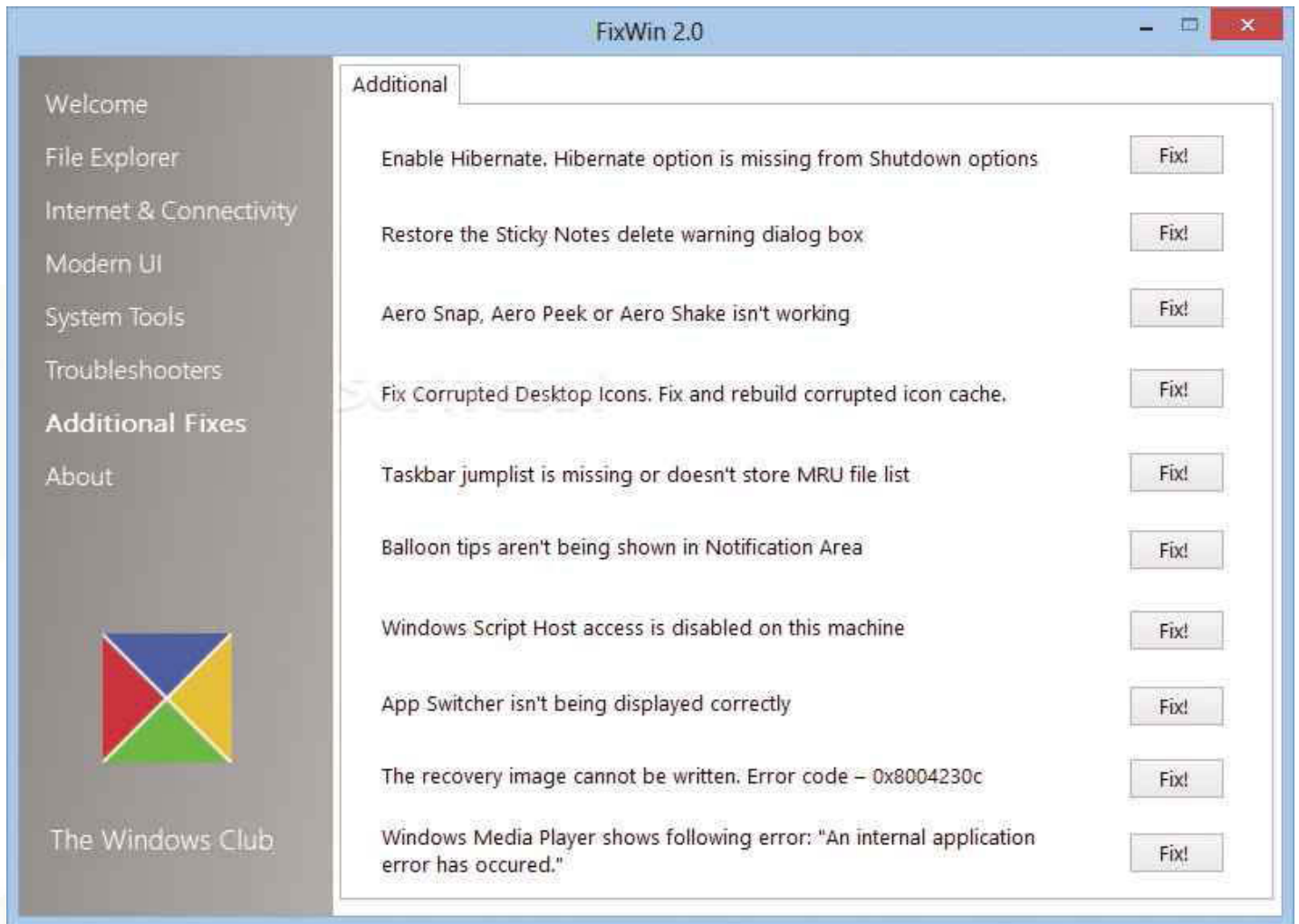
Official Site: tinyurl.com/or7f238

Every once in a while, an application comes along that makes you wonder why nobody has made it before. This month, another such application has arrived, and its name is FixWin. It's a collection of

common Windows tweaks and fixes, all of which are implemented through a single 'Fix' button. However, unlike most applications of this type, the fixes are contextualised by the problem that necessitates them – so if you find your task manager disabled, for example, you can fix it by looking for the description of that problem, rather than the one needle in a haystack of tweaking options that would correct it.

By giving natural descriptions of common problems, and then providing the fix that corrects them, FixWin makes it possible for novice computer users to sort out some of their own problems. The things FixWin does are all fairly simple option changes, or rudimentary registry tweaks, and in truth it wouldn't be at all difficult to find both the solutions and detailed instructions of how to implement them by using a search engine – but the fact is, that's only possible if you know what you're doing. This application cuts out all that work.

As a portable program, FixWin is easy to install and distribute, and its fixes help everyone from novices to experts correct any problems they're having. Fixes are categorised by area – so you get groups like File Explorer, UI, Internet & Connectivity – and crucially, you don't have



to understand the solution to find and repair your problem, as is the case in many troubleshooting helpers.

In case the predefined fixes aren't useful, FixWin also provides a troubleshooting section which helps you find the relevant Windows troubleshooter for your problems, which isn't a huge thing to do, but it does mean the program is never a dead-end for you. If you can't find your problem inside the listings, it'll point you to somewhere that you can. It's also helpful that the application provides an easy way to create a system restore point in case anything the app does goes wrong. This means you can easily roll it back if you need to.

Version 2.2 has added a problem-scanner that'll automatically check whether any of the problems it can repair are currently visible on your system. Although this version only works on Windows 8 and 8.1, it's worth noting that there are also separate versions for Windows 7 and Vista too. It's a fantastic little program, and definitely better than trying to find the problem yourself!

Pros: Great for helping novices to apply complicated fixes in one click

Cons: There's the possibility to cause trouble if you don't create a restore point

Rating: 5/5

Pixopedia 2014 0.2.6

Release Type: Freeware

Official Site: www.sigmapi-design.com/wp

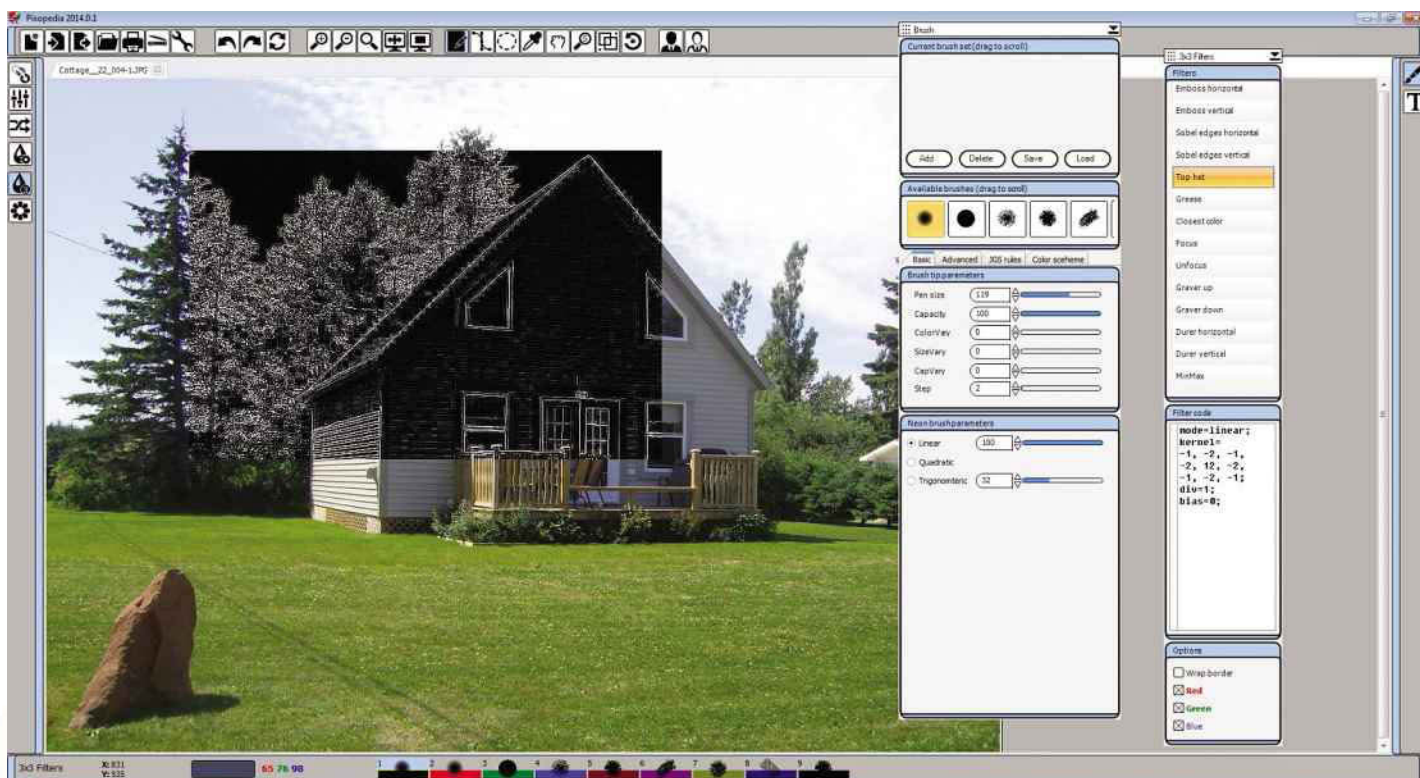
PhotoShop might be the gold standard for photo-editing software, but its high price and complexity means there's a

“ You could be forgiven for feeling intimidated. There are huge numbers of small, cryptic icons that don't immediately explain themselves ”

roaring trade in free alternatives. Pixopedia is one such option.

Initially you could be forgiven for feeling intimidated. There are huge numbers of small, cryptic icons that are attached to tools that don't immediately explain themselves, and the only documentation seems to think the program is several versions old, so it's not much help. Unfortunately, this is often the price you pay for using alpha version software, even examples as fully-featured as this.

A bigger concern, though, is that the interface seems to be designed from the ground-up, so you don't see any familiar Windows tropes around which you can feel comfortable. There's no menu toolbar, for example, just the tool icon and its hidden sub-menus. It's never a great idea for programs to go so far off-piste with their interfaces and, twinned with the lack of comprehensive guidelines, it makes learning to use the program more difficult than it has to be.



“ If you’re still looking for the perfect (free) PhotoShop replacement, this is good enough that you’d be worth downloading it ”

Once you’ve figured out a little more about Pixopedia, though, it reveals itself as a surprisingly well-built and well-designed piece of software. There are different drawing ‘modes’ that prioritise specific tools, and it’s easy to tweak and play with the settings of the existing tools if you want them to act or look a little different. In addition to quirkier brushes and effects, you get the standard set of image manipulations, and there’s support for plug-ins which extends to Photoshop-compatible filters as well as third party ones.

The program’s semi-complete nature (semi-complete might even be a little on the generous side, if we’re honest) means that it’s not going to play particularly well with people who need programs to hold their hand in order to figure out how to use them. If you want something that’s closer to finished than not, try Paint.NET. However, if you want to tinker around with something new, and you’re still looking for the perfect (free) PhotoShop replacement, this is good enough that you’d be worth downloading it. We can’t say that it’ll definitely surprise you. But there’s every chance that it might.

Pros: Lightweight & powerful with some original features

Cons: Terrible documentation doesn’t help the already-confusing interface.

Rating: 3/5

Betawatch

To help you stay on the bleeding edge of software releases, Betawatch is a guide to the experimental and unfinished versions of some of the most popular applications around. Can’t wait for new features? Now you don’t have to!

Firefox 37.0 Beta

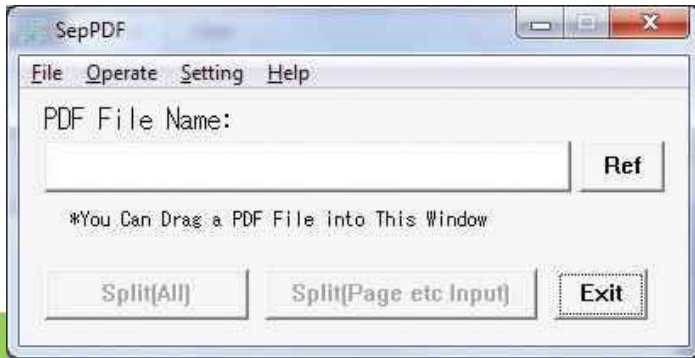
www.mozilla.org/en-US/firefox/channel/#beta

This week in Firefox Beta Watch, new updates to Firefox (for regular readers of these pages, this will come as no surprise whatsoever)! Version 37.0 is barely a week old at time of writing, so here are all the changes you’ll be able to find within it.

First up is the new ‘Heartbeat’ user rating system, which makes it easier to give direct feedback to Firefox’s developers. Search engine changes continue as Bing has been switched to HTTPS for all searches, and the certificates system has had three new features: centralised revocation (through OneCRL), removed support for DSA, and added support for e-mail name constraints. A set of new preferences has also been implemented for the beta cycle.

Changes to HTML5 support include Media Source Extensions for native HTML5 playback on YouTube, improved WebSocket availability and new support for CSS display:contents attribute. Developers also get access to a new security panel and chrome support.

As usual, Firefox’s betas are a great way to get a look at new features. What’s more they rarely (if ever) have negative effects for those who choose to dip their toes in. Download the latest version at the link above and try it for yourself.



“ **SepPDF is hard to criticise. If you want to chop a PDF file up (and we’ve all felt that urge sometimes) then the program will do it** ”

SepPDF 2.68

Release Type: Freeware

Official Site: www.ne.jp/asahi/foresth/home/indexe.htm

PDF files are notorious for their inability to be edited or manipulated by Adobe’s free Reader software, but luckily there are plenty of freeware programs that can attempt some level of alteration. SepPDF is one of them: a tiny (just 300KB!) and fully-portable program which can separate PDF pages into individual files.

The software doesn’t make much of itself. The interface is tiny – little more than a single dialog box – but it’s incredibly intuitive to use. You simply drag and drop the PDF, click “split” and the PDF instantly paginates the file into a selection of individual PDFs in the same folder as the original, all correctly named so that you can organise the ones you want.

Greater control can be exercised if you use the more advanced split feature the software offers, which allows you to extract single pages or specific ranges. You can also specify a different output folder and even retain the original file’s timestamps, if that’s an issue. Even protected PDFs are supported, as long as you have the password.

In a way, it’s a shame that it doesn’t do a little more. The author has a few other PDF tools on their page, but it’d be nice to see some of that functionality worked back into this program to make it more of a suite. The ability to split PDFs into multi-page files would be nice, as would the ability to trim a PDF. Converting to and from JPG would also be a great help, even if it was just a button that interfaced with another piece of software.

Still, SepPDF is hard to criticise in its simplicity. If you want to chop a PDF file up (and we’ve all felt that urge sometimes) then the program will do it, and do it well. You don’t have to install it, you don’t have to wait ages for it to download, and you don’t have to spend a long time learning its various features. You can get in, click one of two buttons and then get out. It might be small, but you have to respect that level of focus.

Pros: Super-functional design

Cons: Only useful for single tasks

Rating: 3/5

ReDownloaded

This month, in our regular retrospective section, we’re looking back at the May 2013 instalment of Download Directory to see how the programs we reviewed have fared. Are they better? Worse? Gone completely? Here, we find out.

RainbowDrive

www.compall.com/apps/rainbowdrive

Reviewed Version: 2.0.0, **Current Version:** N/A

This cloud-storage aggregator program seemed like a good idea, giving you access to multiple forms of online storage through a single program, including Dropbox, Google Drive, SkyDrive and Box. The program itself needed improving, but as an idea it was good. Unfortunately, the Windows version seems to have disappeared. There are still mobile apps, but the site looks very much like it hasn’t been updated since late 2013. Therefore it’s reasonable to assume that this has been abandoned.

WaveShop Portable

sourceforge.net/projects/waveshop

Reviewed Version: 10.0.07, **Current Version:** 10.0.14.001

WaveShop is a stripped-back audio editor that looks to give users a free alternative to the technically-complex or paid-for suites like Audigy, GoldWave and Audacity. If you don’t know a Nyquist Prompt from a Spectrogram (or, indeed, don’t care what they represent) then this is probably the editor for you. It hasn’t been updated since April last year, but (while that’s a little disappointing) it’s still a nice enough piece of software to be worth giving a try should you need such functionality.

Droplit

sourceforge.net/projects/droplit

Reviewed Version: 5.1, **Current Version:** N/A

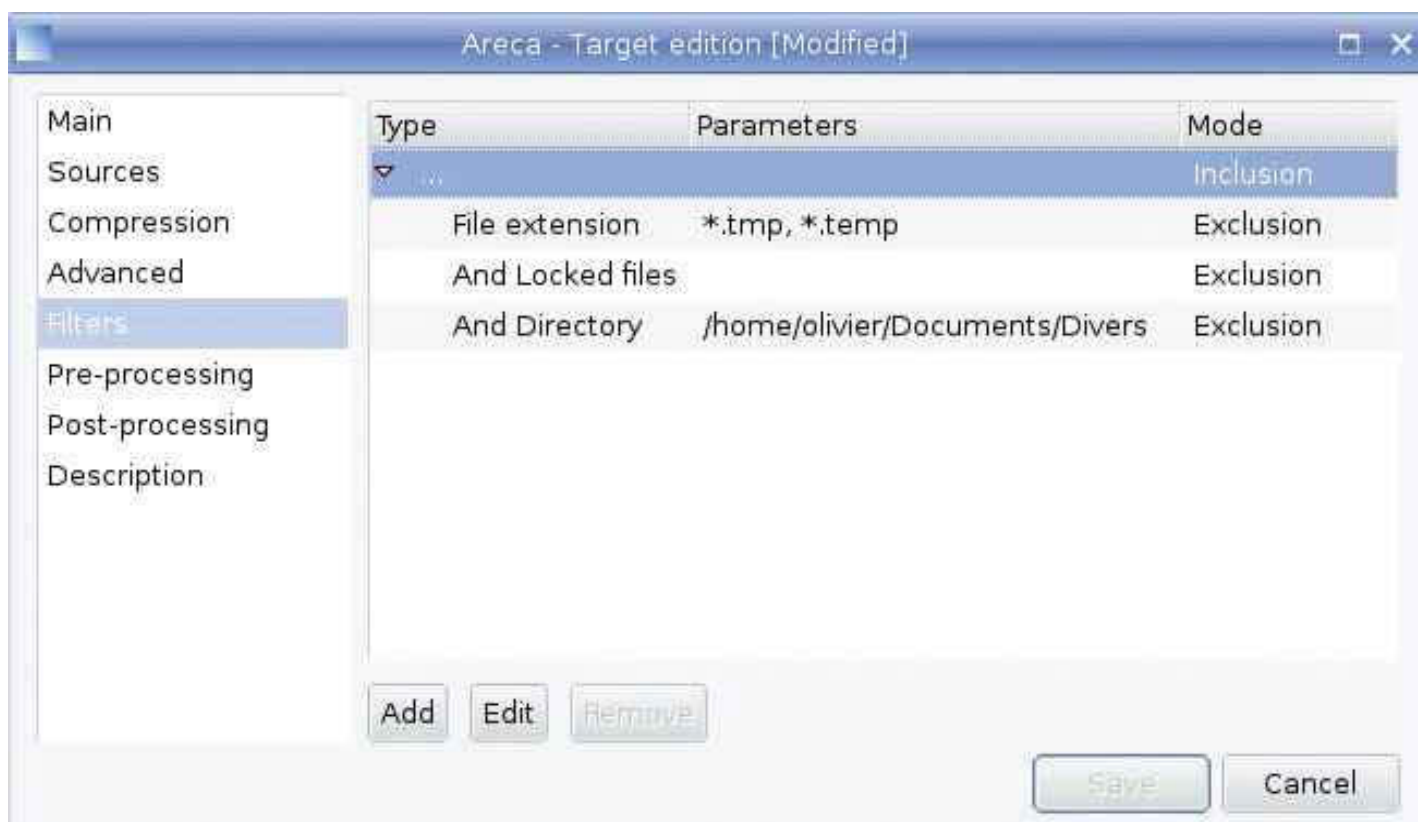
Droplit is an extension for Windows Explorer that gives you more powerful file management tools, as well as intelligent file renaming and organisation. Although it’s a little on the complex side, at the same time it’s feature-packed. It was last updated in October last year, which suggests some level of active development on the part of its creators. We can’t possibly list all of its capabilities in the space we have available here, but the filtering, indexed renaming and drag & drop auto-processing are all great. Try it.

DiffView

www.adlice.com/software/diffview

Reviewed Version: 1.0.2.0, **Current Version:** 1.2.0

If you want to keep track of changes to your files and registry, DiffView can do that for you. Don’t be fooled by the similar-looking version number, though, DiffView was completely rewritten in 2014 to make its scanning engine faster and its code more stable. In all of its versions it’s a useful tool for sniffing out malware and maintaining system security, and its seemingly-active status makes this the best version of that idea that we are currently aware of.



Areca Backup 7.4.9

Release Type: Freeware

Official Site: sourceforge.net/projects/areca

Finding the right backup suite is a challenge. Try to use Windows' built-in features, and you're likely to end up with something inadequate at best and confusing at worst. Try an expensive piece of commercial software, you're bombarded with features you simply don't need. For those reasons alone, it's worth looking at an open-source alternative, and the one that's caught our eye recently is Areca Backup.

Aimed at advanced users, Areca Backup supports a number of different methods. Incremental, differential and full backups are here alongside advanced iterative processes (such as delta backup, which stores only the modified parts of any files changed). Version tracking allows informs you of different file versions within backups, so if you ever need to recover an older file, it's right there for you in the archive viewer, which is as powerful a backup-browser as you'll ever need.

When performing backups you can use regular expressions to filter out (or in) files, and the results can be compressed and encrypted for easy storage and safety. Backups can be stored on a local drive, removable drive or a remote server – thanks to automated FTP transfers. Any backup feature you can imagine is supported.

Similarly interesting are the post-processing features. Once a backup has been completed, it can run a script or send an email notification containing details like the date, time, and output name of the backup's archive. If it goes wrong, it can even be used to notify you with the error message so that you can run it again.

Where the system falls down is as a result of its platform independence. It doesn't help you back up your system, only sets of files, so there's no specific option for keeping Windows backed up – you have to construct one yourself. Similarly, there's no scheduler as it's designed to be run from scripts. Despite those omissions, it's a powerful and versatile tool, well-made and easy to use.

Pros: Feature-packed but not over-stuffed

Cons: Not great for system-restore backups

Rating: 4/5 [mm](#)

Remembering...

AGP

David Hayward recalls a time with the Tom Selleck of motherboard connections

To think we used have make do with graphics cards that had mere kilobytes of memory on board and fitted into a spare ISA or the-then more advanced PCI slot on a motherboard.

They were, of course, the bees knees back then, and for the sake of running something like **Commander Keen**, they did the job well enough. However, as always in this field of interest, time marches ever onward and as the games, imaging and even running the operating system became more resource hungry, the performance and power required from the graphics card grew exponentially.

The old ISA was out, gone and never to be seen again. PCI was newer, but couldn't deliver the bandwidth needed for the next generation of graphics card. This is when AGP (Accelerated Graphics Port) started to make an appearance.

AGP was introduced in 1996 and brought to the market – as in made available by motherboard manufacturers – in 1997. This brought a dedicated connection for the graphics card, a connection that was blisteringly fast and never had to compete with any other device for resources and communications with the CPU and memory.

Its History

Intel brought forth the AGP 1.0 slot on its new generation of Pentium Socket 7 motherboards. The AGP 1.0 slot required 3.3V, had a clock speed of 66MHz and could throw resources around the system at a rate of around 256MB per second.

It may not sound like much, but back then these were speeds as yet unheard of in a mainstream, publicly available home computer.

As the AGP slot evolved, the bandwidth increased significantly. AGP 1.0 offered 1x and 2x speeds, AGP 2.0 and 3.0 offered 4x and 8x, which in terms of bandwidth classes equalled something along the lines of:

AGP 1x – 256MB/s, **AGP 2x** – 534MB/s,
AGP 4x – 1066MB/s, **AGP 8x** – 2133MB/s

The AGP slot was also the first connection on the motherboard to offer varying-sized notches to prevent the wrong type of AGP card being slotted in and the first to include the locking clip at the back of the slot.

The result of this bandwidth were the first real 3D cards, the 3D Voodoo Banshees of the world, and the games and programs that drew on such phenomenal power. Eventually, though, the demand for even

Did You Know...

- The Nvidia Geforce card was the first 3D-accelerated, transform and lighting, triangle data handling AGP performance card.
- Windows NT AGP graphics drivers were slightly better than Windows 2000's.
- A 'friend' once claimed he owned a dual slot AGP motherboard. We never saw it, though, and still don't believe it existed.
- We think the Radeon HD3850 was the most powerful AGP card ever made. What do you think?

faster bandwidth and more powerful cards gave way to the PCIe, which had bandwidth classes up to 16000MB/s. There were a few examples toward the end of its life, with AGP Pro, Ultra-AGP and Ultra-AGP II, but they couldn't keep up with the newer, higher-performing technology.

The Good

AGP brought us 3D gaming and 3D design graphics cards and for that we'll be forever grateful.

The Bad

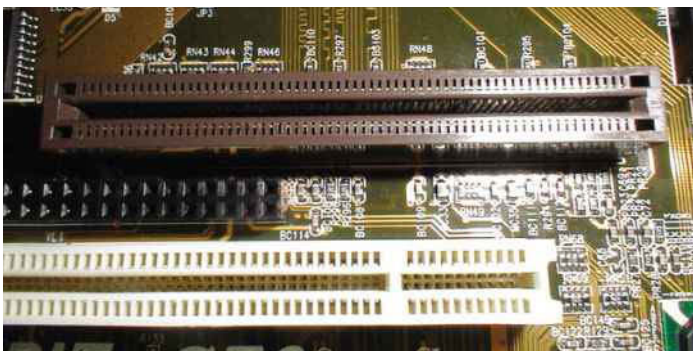
The AGP slot could be tweaked by overclockers more than any other graphics technology before it, but an overzealous tweaker could brick their entire motherboard with a poor choice of voltage settings. Remember, there weren't any of these solid-state capacitors or dual BIOS things back then.

You took overclocking in very small steps, powered on and if Windows didn't crash, you moved it up a notch.

Conclusion

AGP taught us a lot about BIOS settings, overclocking and introduced the mind-numbing variety of numbers, makes and models to enthusiast computing. Where once you could roughly follow a conversation on motherboards, it suddenly became laced with code numbers, voltages and bandwidth.

For that we thank you, Intel and the AGP slot.



▲ The AGP slot gave us proper 3D graphics and much power indeed



▲ Possibly the greatest AGP card ever made?

RETRO ROUND-UP

Dave Edwards casts an eye over more homebrew than ever before as the Retro Round-up doubles in size

Welcome to Retro Round-up, *Micro Mart's* monthly look at new games for old computers. This month's article is 100% bigger than previous ones. There are two reasons for this: the surge in production of new games for old computers and the fact I'm obsessive enough to want to document them all.

The limited space of previous articles meant a more limited answer to the important question of whether each new release was actually any good or not. More space for more screenshots and to discuss the game itself is therefore very welcome. Secondly, it seems that you all love the Retro Round-up – but if you all love reading it, then that's as nothing to my love of writing it.

A Brief History Of My Computer Time

My first computer was a Commodore Vic 20 (8KB of memory); my second an Acorn Electron (32KB); my third the Spectrum 128KB (with the Light Gun James Bond 007 pack) and my fourth an Amiga 500 (1MB). A natural progression in terms of capabilities, and probably one many of you reading will identify with.

However, coding on the Amiga wasn't as easy as it was on the first three, as there was no Basic line editor, so I took a step 'backwards'. Whilst I played games written by others on my Amiga, I continued my coding on the Acorn Electron. As time went by and the consoles took over, I inherited the Acorn Electron User Group. Finally, when the Internet began changing the world – and emulators on PCs began replacing the original hardware of days gone by – I found a new passion, collecting up all the Acorn Electron stuff ever and archiving it over at www.acornelectron.co.uk.

I now build new web software for a living and I review and archive old retro software for fun. I also have my own YouTube channel (tinyurl.com/msvejhi) and have been active in this wonderful world for over two decades. For this first extended foray into retroland, let's shine a light on some games currently on general release for the Spectrum, BBC Micro and Amstrad.

Typo Tyranny

To the Spectrum first, and I'm sure I'm not the only one to raise an apostrophe-and-grammar-laden eyebrow at the title of *Battery's Not Precluded*. Surely, if anything it's *Batteries Not Precluded*, but even then: precluded? For all I know, its title is a nod to some of the weirder cassette-based inlays of games in the early Eighties. The great *Kenny Danglish Soccer* on the Amstrad perhaps, or the wonderful *Valley Of The Phoroh* for the C64?

I digress. Title aside, *Battery's* comes from the Cronosoft stable for the standard £4 plus P&P (from www.cronosoft.co.uk) and gives you control, on screen one, of a green remote-control car. The aim of this first game is to drive around the screen until a number of additional remote-controlled cars have teleported in, and you have caused all these nemeses to crash into each other and wipe each other out. Use the power of the brain, and accelerating and braking, to achieve this.



Take control of a remote control car in the grammatically challenged *Battery's Not Precluded for the Spectrum*

Each screen presents a different remote-controlled 'hero' and mission. On screen two, you take control of a hot air balloon; on three, a racing car, and on four a bubble-bursting spacecraft. Throughout the action, a pounding beat by Spectrum music god Yerzmyey plays on interrupt.

The games themselves are from Jonathan Cauldwell, and represent a refreshing alternative to another *Egghead* title. All of them use the same game engine and play very well, in a sort of mindless way that doesn't demand any real attention. A typical game lasts about six minutes. *Battery's* is pretty addictive to boot, and a snip at the price being asked for it. See it in action at tinyurl.com/kakodzd

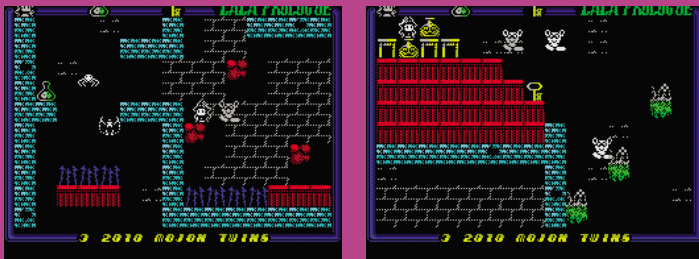
The games themselves are from Jonathan Cauldwell, and make a refreshing alternative to another Egghead title

Another Game I Hate

Monument Microgames, who released The Mojon Twins' *Zombie Calavera* last month (See MM 1350), have announced another of the Twins' games will shortly be unleashed on original cassette. *Lala Prologue*, another platform-based graphic adventure, may be available from www.monumentmicrogames.com by the time you read this. If so, it will probably cost the standard £7 plus P&P.

In the game you take on the role of a wannabe witch, who must collect up the ingredients for her spells from numerous rooms. You must jump from platform to platform, avoiding the bouncing nasties, while certain areas of some rooms can only be accessed via locked doors, so you'll need to grab any keys you find too.

While it all looks more colourful than *Zombie*, *Lala* uses exactly the same game engine as its predecessor – which means that the



*Lala Prologue – a cramped up version of
Zombie Calavera that everyone should avoid*

same things drive me mad. The punishments meted out for simply attempting to play these games in exactly the way you would naturally expect to are, frankly, ridiculous. If I approach a bad guy and 'jump', I expect to jump gracefully over him; I don't expect the 'jump' to be a weak 'thrust' that barely lifts me off the ground!

Additionally, the opening rooms of *Lala Prologue* are mostly arranged vertically. So, when you make contact with a bad guy (easily done considering the 'thrust-jump' feature) he not only wipes some of your energy, but also flings you away from him – either into further danger, exacerbating the situation, or into the space between platforms. You then get to watch as the eponymous Lala plummets through all of the screens you have oh-so-carefully traversed over the past ten minutes, winding up right back at the very start.

If the classic *Rainbow Islands* had done this to its players it just wouldn't have kept them playing – and that is precisely the problem here. The game has all the lastability factor of an ice-pop in the Sahara desert, and manages to even make *Zombie* seem comparatively forgiving.

It's a waste, really. The music is good and the sprites, though small and over-detailed, are passable. If I flip my perspective, I'd imagine the Mojon Twins would protest that learning the 'thrust-jump' and deliberately hitting the bad guys to deliberately be thrown in a particular direction is a skill of the game itself. Sorry, though, that's far too silly. You shouldn't have to accurately hit bad guys at exact angles in a platform game of this type. Number one rule of gaming: Cute=Simple. In fact, I hate *Lala Prologue* so

A playable first version appeared in 2009 – but the game itself has then took five years to stagger to release

much that, if Monument wasn't already invested in releasing this game to the wider public, I think I would be encouraging it to question whether it's actually deserving of it.

Worth Waiting For

The best entrepreneurs look for a gap in the market, find it and then – as the business books advise – tell no-one about how they plan to fill it. Homebrew developers might often be well advised to take a leaf out of such books, rather than announcing a project when they've developed little more than a concept. *Mountain Panic* is a game that's been more a victim of premature hype than most. A playable first version appeared in 2009 – but the game itself then took five years to stagger to release.

Having now finally seen the light of day courtesy of Retro Software (www.retrosoftware.co.uk), *Mountain Panic* pits you in the role of an adventurer in the Antarctic. Your quest is to collect four stars, in order to open a portal to the lair of a monster. Until you've done so, you're confined to caverns and mountains all pleasingly rendered in the BBC's highest resolution mode. You can't jump and you're in constant danger of being mauled by the icy wastelands' unkillable, unfriendly inhabitants.

Although you're initially defenceless, you'll quickly find a rope. With careful aiming of this at anything solid (and at a 45° angle) you can propel the rope outward and clamber out of danger.

Mountain Panic is quite mesmerising. Your eskimo-esque protagonist is supplied with a generous amount of energy, but the rooms are challenging enough for the exploration to feel that playing the game is exactly that – an exploration.

The only real disappointment is how small it is. There are only about half the number of rooms you'd realistically expect. To be



Retro Software's new professional release features an agile eskimo in a colourful world of caves and mountains



The Krystal Connection on the Beeb is actually about collecting up bones. Go figure

as fair as possible to Retro Software, that is probably the resultant trade-off for using the best BBC screen mode and including a monster 'Big Boss' fight at the end. Precisely because it is so small, you have a high probability of meeting it (the monster) and probably a better-than-average chance of completing the game entirely on your fourth or fifth try.

Mountain Panic costs £7 plus P&P and is available on original 5.25" disc. Check out the video at tinyurl.com/m2rgrea for a closer look.

Late Release

Battery's and *Mountain Panic* do feel somewhat influenced by modern games in their creation. Retro Software's *The Krystal Connection* is the polar opposite, though. It is a fairly standard platform game, where each screen is accessed serially, and might just as easily have been released in 1984 – not surprising as, apparently, this is when it was actually written.

Your aim is to collect up all the bones lying around the various screens, which also feature a few patrolling nasties that can detect your presence and come hurtling towards you as soon as you both share a platform. These have to be either avoided, or temporarily trapped, allowing you to pass 'through' them. Hence you must leave yourself enough time when moving onto a platform to drop a trap, take a step backwards, wait for the trap to capture the bad guy and then run past him. You access each platform via a lift which you can direct up and down when standing on it.

As a game concept, it's clever but a quite fiddly affair. *The Krystal Connection's* gameplay is also wildly unpredictable. Dropping the trap seems sluggish – often the 'drop' key just doesn't register, yet when attempting to take a step backwards, the direction keys can register twice. Such tedious features of the game render it pretty unenjoyable, and the level design also feels unimaginative. You can see it in action for yourself, though, at tinyurl.com/p8zmlrt.

A cassette-based copy of *The Krystal Connection* costs £3 plus P&P. Curiously, Retro Software also has free releases (amongst them *Castle Raider* (See MM 1350), *Jungle Journey* and *Hard Hat Harry 1 & 2*) that are superior to this one.

Zapping Good Fun

Zap, our third and last Retro Software BBC release, is a straightforward shoot-'em-up which puts you in charge of a lone spacecraft. The aim is to conquer as many zones as you can by either blasting the bad guys out of existence or avoiding them and all of their bullets. It's quite an engaging game, as you can see at

The formations they use to attack you create ever more intricate patterns

tinyurl.com/lxnetgf, and it's can get intense, but it does allow you to develop a strategy to take you further and further. Moving around a lot in the central lane of the screen, for example, works very well.

While the cascading arrays of bad guys are the standard *Space Invaders* fare, the formations they use to attack you create ever more intricate patterns. Control of your spaceship is also excellent, and frankly, with all of those bullets flying around, it needs to be. Disappointingly, however, the big boss at the end of each zone is always the same and, because crossing a zone is fairly speedy, rather than sweating, you'll soon be yawning when he makes his appearance yet again. A cassette-based copy of *Zap* costs £3 plus P&P.

You can order all Retro Software games by e-mail via orders@retrosoftware.co.uk. State quantities and format by referring to www.retrosoftware.co.uk/wiki/index.php/Prices.

And so finally, to our first Retro Find Of The Month...



Zap is mindless fun for the BBC Micro which makes the mistake of repeating the final battle ad infinitum



The final confrontation from *R-Type 128*, and the Bydo demos on the Amstrad never looked nastier

Retro Find Of The Month

R-Type is the shoot-'em-up that refuses to die. Originally a coin-op, it has made it to every format from the Commodore 64 to the Playstation. The Spectrum conversion has even been immortalised in an eBook – a very illuminating read named *It's Behind You*, by Bob Pape (Available free at bizzley.com).

R-Type's latest incarnation is on the Amstrad; *R-Type 128*, by Easter Egg productions. As you might have expected, the Amstrad was famous enough to have received its own version of *R-Type* in 1984. However, the 1984 version was essentially the 48K Spectrum version converted to the Amstrad, meaning the Amstrad's extra memory wasn't used. The Easter Egg team has created a version of *R-Type* more suited to the Amstrad; from the name *R-Type 128* you can deduce that it uses the full 128KB.

When a new version of a classic game is created, reviewers sometimes lose track of what's important. Instead of judging it on its merits as a shoot-'em-up, they get diverted into comparing the

old version with the new one. So, to make this easy, let's imagine *R-Type 128* is simply a brand new shoot-'em-up for the Amstrad, and judge it by those standards.

It begins atmospherically, with your drone ship seized by a crane and flung into the title sequence. It also allows the player to slowly upgrade the ship by collecting power-ups, and the first power-up is a ball, which can attach to the front or the rear of the ship. It can be detached at will to unleash a hail of bullets in various directions. All very useful for dealing with *R-Type*'s plentiful supply of aliens without needing to manoeuvre too closely towards them.

While the graphics and sounds are wonderful, with everything scrolling without the slightest flicker, the game itself is very hard. Even with ball, guns and the super-laser (which you enable by holding down the fire button for a while) the odds are stacked heavily against you. Unfortunately, whilst everything may scroll magnificently, your drone ship moves in quite a jerky manner. This renders the playing area is so cramped that, when you're under attack, the screen explodes into too many sprites for the human eye to track. See tinyurl.com/on5pj6g to watch it in action, and see what we mean.

Of course, that's not to criticise Easter Egg for its work in putting this together. It has achieved exactly what it intended: to create a superior version of *R-Type* that pushes the Amstrad to its limits, yet works within its limitations. Ultimately, though, the Sega Master System version is still better than either Amstrad version. Although you may indeed marvel at *R-Type 128*, you may also wonder what the point of it is.

If you're committed to the platform, though, *R-Type 128* and a CD of its soundtrack, is available free from www.rtype.fr.

Goodbye...

That brings us nicely to the end of this month's bigger Retro Round-up and I hope you'll agree that bigger in this case most definitely means better. The additional space means all new old games now get much more exposure than previously – and we might even have a few special features too in next month's article. Watch this space and see you next month. mm

Retro Software

www.retrossoftware.co.uk

<i>Mountain Panic</i>	BBC Micro	£7
<i>The Krystal Connection</i>	BBC Micro	£3
<i>Zap</i>	BBC Micro	£3

Monument Microgames

www.monumentmicrogames.com

<i>Lala Prologue</i>	Spectrum 48K	£7
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Cronosoft

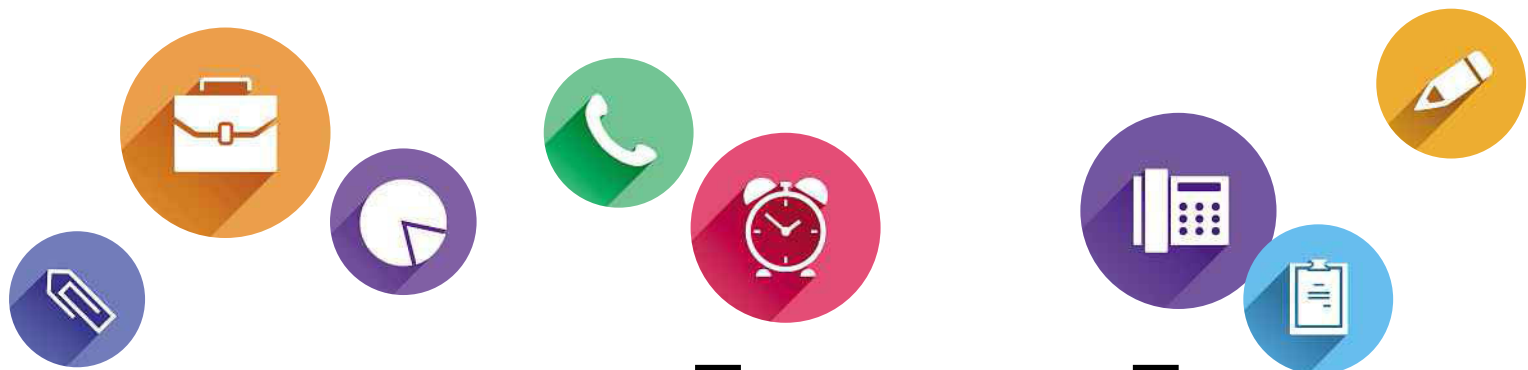
www.cronosoft.co.uk

<i>Battery's Not Precluded</i>	Spectrum 48K	£4
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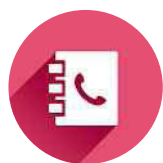
Easter Egg

www.rtype.fr

<i>R-Type 128</i>	Amstrad	Free
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Food And Drink Apps For iOS



Get the most from your coffee and dinner with **Keir Thomas's** look at six interesting eating apps for iPad and iPhone



We spend a lot of time eating and drinking, on balance, so it's perhaps not surprising that the category of food and drink apps is popular. There's certainly a lot of choice in the App Store, with apps to scratch just about every itch. Typically for kitchen activities, most aim to reduce or even eradicate the labour we put into preparing meals and beverages.

Below we look at six great examples, and as usual all are free of charge, although some offer in-app purchases. All were tested on an iPhone 6 Plus and Retina iPad.

Starbucks

By their nature, apps must be simple to succeed, but it might be that Starbucks has taken this concept a little too far. We're fairly sure older versions of the app let you see a virtual menu of drinks and food offered by the mermaid-headed chain, but the latest version seems like little more than a swap-in for a Starbucks payment card.

The app splits into two halves, switched between by tapping the headings at the top of the screen: Pay and Stores. However, the default screen seen when the app first starts lets you view your current reward level (Starbucks' system by which you earn free drinks).

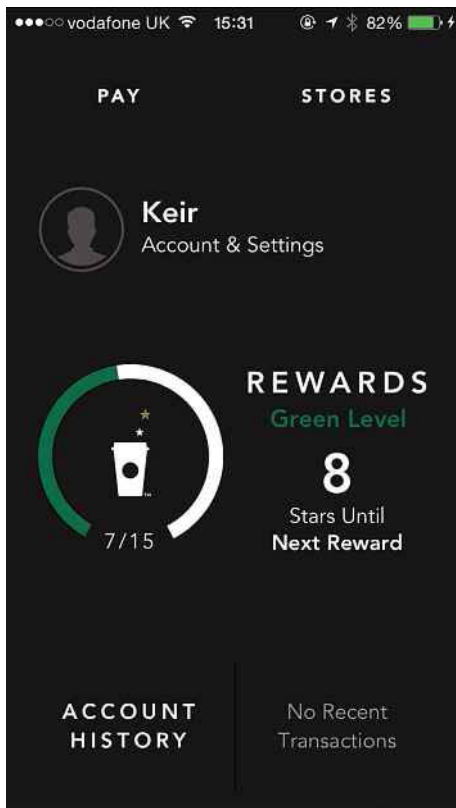
Tap the Pay heading, and you can view your current balance on your card, as well as add money by registering a debit card (which is easier, we guess, than simply using your debit card in store). You can also set up an auto top-up that will transfer money when the balance falls below a certain amount. You can also opt to pay for purchases while in store, of course, in which case a barcode is shown that you present to staff. The app also

integrates with the built-in iOS Passbook app, where you'll find the same barcode and details of your balance.

The Stores link unsurprisingly uses your GPS location to tell you where the nearest stores are. A map is shown, and you can tap the filter button to only see stores offering certain features, such as 24-hour opening, drive through or that are quite simply open at the current moment.

Tap on an entry in the list and you'll be invited to add it as a favourite, shown the opening hours and told what amenities the place has (such as wi-fi). Unsurprisingly, tapping the Directions heading switches you out to the Maps app with the route programmed in, while tapping the phone number switches you to the phone app.

“ We’ve no idea if Jamie Oliver uses Marmite in his cooking, but it would be apposite ”



▲ Starbucks' app is useful if you need to scratch the coffee itch but bizarrely lacks menu or drinks details

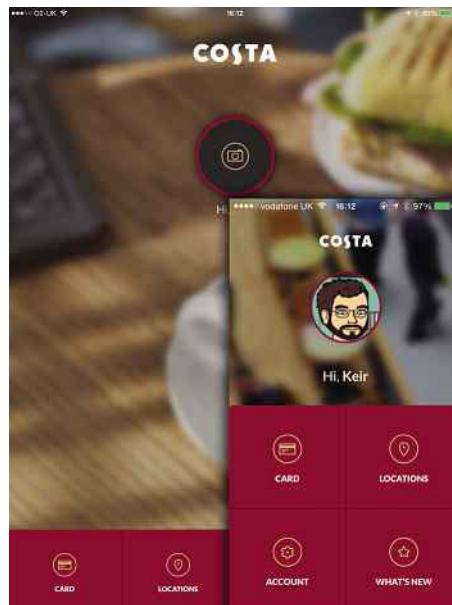
As a way of scratching that irresistible Starbucks itch when out and about in a new area, this is a useful app, but it could have been more. It would be nice for people like vegetarians or coeliacs to see what food is on offer, for example. Notably, the app only runs on the iPhone/iPod Touch and not on an iPad.

Costa

If we're going to include Starbucks' app then surely we have to include Costa, its popular rival in the coffee chain business. For what it's worth, we'd also include Café Nero in our round-up, but it doesn't have an app.

Sadly, Costa's app doesn't expand much on the limited functionality of Starbucks' effort. Again, it ties in with Passbook, this time to let you accrue or spend points by presenting a barcode. Points are earned with every pound you spend in store. You can also see how many points you have, of course, and a nice touch is the ability to see how many points you earned over recent visits, as well as how much you've earned overall in the year.

Tapping the Locations button lets you find Costas nearby, and this includes Costa Express outlets – the little one-button coffee machine operations found in places like pubs or petrol stations. Tapping an



▲ Like the Starbucks app, the Costa app feels like a wasted opportunity, and much more could be done

entry shows a Get Directions link that switches you out to the Maps app with a route programmed in, but you don't always see additional data like opening hours or special facilities within the app. As with the Starbucks app, which is eerily similar, there appears to be no way to view drinks or food menus.

Like the Starbucks app, the Costa app is location aware, so if you're within reasonable walking distance of an outlet an icon will appear at the bottom left of the lock screen. Drag it up and you'll be

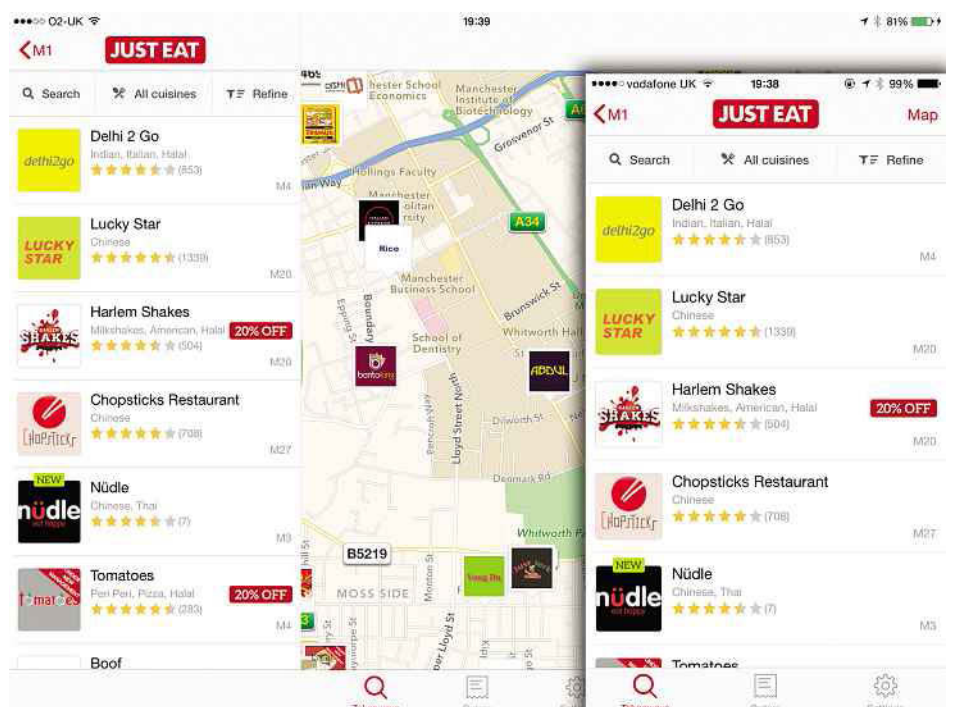
told where the store is. This is very neat, but it's more the case we should thank iOS developers for it.

The Costa app does have a few interesting quirks. You can customise the background, for example, and add a photograph of yourself – either by snapping one with the camera or by using one from your Camera Roll. A What's New section provides info about new drinks. However, that's about all we can usefully report about the app, and this isn't an app you'll be using when you don't need to in order to collect points. Again, it feels like a missed opportunity.

Just Eat

Fast food is a serious business and we have to applaud the folks behind Just Eat, who appear to have organised the nation's independent takeaways so people can place orders through the app without any hassle. If that doesn't strike you as impressive, consider that it involves Just Eat being aware of the current menu for the establishment, as well as knowing more obvious facts such as where the places are located and their opening times. It's Herculean in scope – and successful too, as you'll know if you've been near just about any takeaway recently where you'll see Just Eat window stickers.

The app opens to a simple input field where you can enter your postcode. What's perhaps not obvious is that tapping the location icon at the right of this will look up your postcode via GPS. Unfortunately,



▲ Just Eat is all about getting fast food to you and makes it a doddle to order deliveries or collections

in the rural corner of Derbyshire where we live it subsequently reported nothing at all (even though we have our share of establishments!), but a few trial postcodes for other places was vastly more successful. On an iPad, results are shown in a list at the left, while pins on a map at the right of the screen show their locations. On an iPhone the list is shown full screen, and tapping the Map button at the top right shows the pins. A nice touch is the fact that if an establishment is currently closed, this will appear as a label on the pin. However, it's when viewing a map that you encounter a fundamental design flaw of the app, which is that it searches only via postcode. This can be pretty vague, and the app has no idea where you are, so it can't plot routes to get you to your nearest Chinese takeaway or pizza place. In fact, your current location simply isn't shown on the map, so you can't even work out a route on your own unless you fancy looking at street signs and doing it the old-fashioned way.

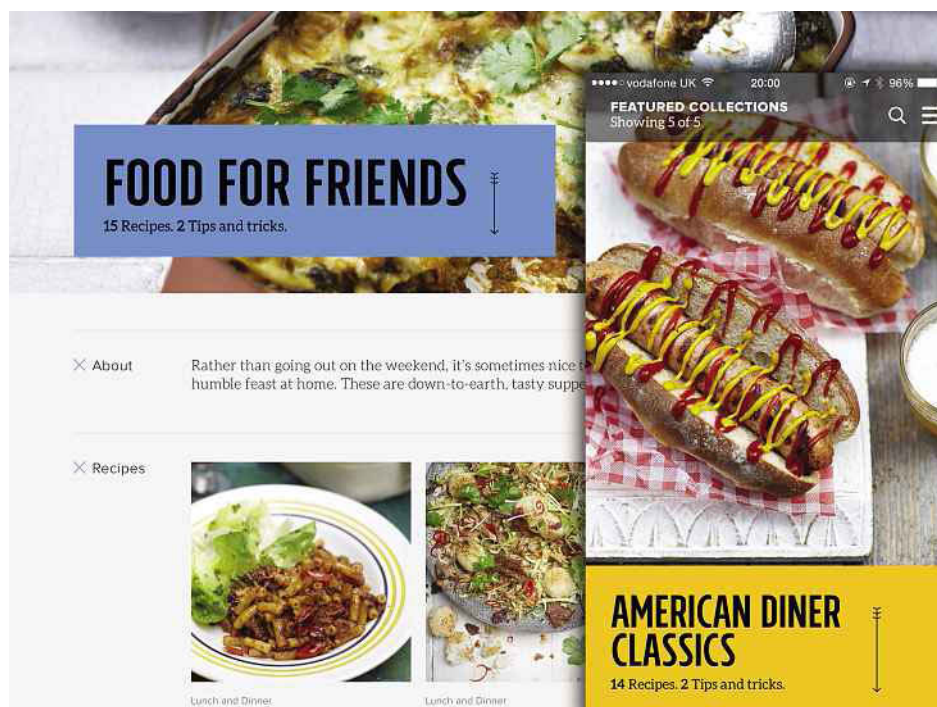
Establishments can be filtered by cuisine, with the app being aware of everything from 'American' to peri peri, and you can also refine the list by rating or offers currently being run, distance and more.

Tapping an establishment shows its menu, and you can tap the plus icon alongside each entry to add it to your basket. If there are minimum order amounts for delivery, then you'll be told both via a label above the menu and in the basket area.

Unsurprisingly, ordering requires you have an account with Just Eat. This is a little hasslesome, but we also guess that the potential for abuse with anonymous ordering is significant – especially considering the teenage market for smartphones and tablets. Ordering involves confirming the delivery address (useful if you're ordering at a friend's house), after which you'll be given a delivery time estimate and invited to input payment details, which you can also save within the app for future use.

Orders can be tracked by tapping the icon at the bottom of the screen, including viewing orders you've placed in the past in case you fancy the same again.

“ It feels odd taking advice about eating sea life from an agency supposedly in the business of protecting it ”



▲ Jamie Oliver's app is a mix of good recipes and good app design, although it could be more a tad more accessible

Just Eat keeps things simple but perhaps a little too simple, and the inability to plot a route to the establishment in order to collect your order seems baffling. There isn't even a way to pass the postcode of the establishment to the Maps app.

Jamie Oliver Recipes

We've no idea if Jamie Oliver uses Marmite in his cooking, but it would be apposite, because he's certainly as divisive as the famous yeast spread is: people tend to strongly like or dislike him. And now here he is following us onto our phones and tablets, having already dominated our TVs and bookshelves. His app provides a taster (excuse the pun) of the whole Jamie experience, and you get a free selection of recipes that's updated every Monday. When we tested the app, five featured collections offered three free recipes each. You can try out the full recipe collection free for seven days, but then it's a whopping £1.99 every month to keep your nose in the recipe book. To be fair, Jamie says he's adding new stuff all the time, but he'd have to in order to justify a monthly subscription that's (pun ahead!) hard to swallow for all but the most ardent fans.

Recipes are shown as thumbnails on both iPad and iPhone, with the only difference being that on an iPhone the thumbnails are arranged in a single vertical column, while the wider screen of the iPad allows them to feature side by side. Tapping any opens the recipe for viewing, with a nice high-res image heading everything. A list of cooking steps and ingredients/equipment needed are provided side by side on an iPad, while tapping a button at the bottom of the screen on an iPhone switches you to the instructions.

Tap the Cook Now button on a recipe, and you'll be treated to illustrated steps. If ever you've wondered quite how large to dice that pepper or celery, then this is for you. Once again, high-quality and high-res images are used throughout.

A terrific feature is the ability to instantly add all the ingredients to the app's shopping list. You can plan a whole week of Jamie's recipes, for example, and then use the app's shopping list to go around Tesco. The shopping list section of the app helpfully splits the items you need into aisles, such as 'Fruit and Veg' or 'Milk and Dairy'. Tapping a share button lets you email the list too, although in our test we got an error message saying the 'device is not currently set up to send mail'. It was, of course, although we use Outlook rather than the built-in email client. This obviously confused the app.

Also packed away in the app are videos of Jamie doing his thing (over two hours' worth, apparently), and the search function



▲ A Swiss army knife for cooks, *Escoffier Cook's Companion* provides encyclopaedic knowledge of ingredients and utensils

lets you find recipes to match ingredients, style or other keyword. I even found a featured collection to suit my vegan diet.

Jamie Oliver Recipes is a well-made app, and most would agree you're not going to go far wrong with one of his recipes. However, it does feel like the app is created for Jamie fans, rather than fans of cooking. We're sure there are recipes for beginners in there somewhere or recipes for coeliacs, and it would have been nice if there was a direct, sign-posted route to these rather than having to wade through featured collections or search.

Escoffier Cook's Companion

Due to his death nearly 80 years ago, it's impossible to ask what the legendary French chef would say about his name being attached to this app – especially considering it has nothing to do with him. It doesn't feature any of Escoffier's recipes or his writing, but instead is a kind of Swiss Army Knife for the kitchen.

The app features six sections, presented in a grid of icons on an iPhone and in a neat circular arrangement on the iPad. The first section, Ingredients, is essentially an encyclopaedia of recipe components – everything from Adzuki Beans to Zucchini (literally!). Tapping any entry shows an image, category, storage temperature and other data such as what the ingredient is typically used for and how to evaluate the quality of the item when purchasing. Put simply, it's a comprehensive shortcut to expert level cookery and is justification alone for installing the app.

The Timer component of the app offers little you won't find in the built-in Clock app on iOS, although you can set several timers counting down at the same time, which can be helpful tracking individual components as they cook.

The Converter part of the app lets you convert just about any unit of measurement you might find in cooking – Celsius to Fahrenheit (and vice versa, of course), imperial to metric weights, millilitres to tablespoons and even millimetres to feet (useful when measuring sausage rolls, we guess).

The Equipment section matches the Ingredients component of the app in providing a comprehensive encyclopaedia, but this time of cooking tools. Again, the entries are extensive and genuinely useful and include notes on cleaning and also health and safety. You get the impression that somebody really has thought this app through and tried to make it genuinely useful.

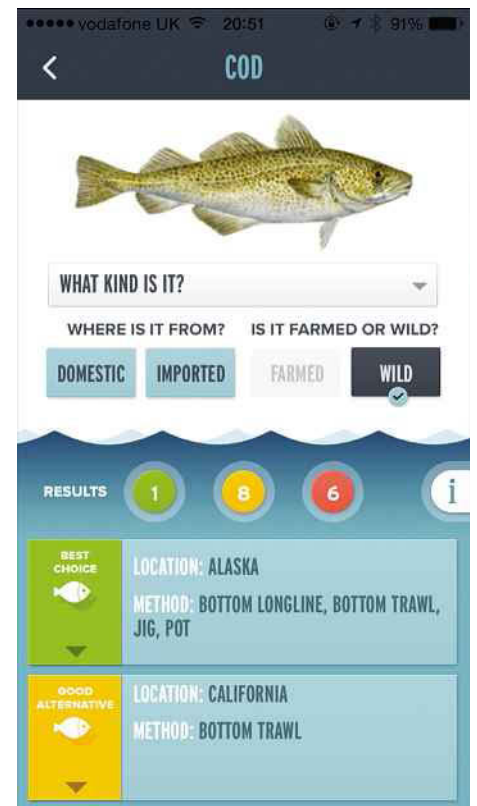
Finally, a Glossary section provides instant and quick look-ups for all cooking terms, whether that's ingredients, tools, cooking terms (al dente etc.) or even French language terms frequently used in cookery. Items with a speaker symbol alongside even provide a pronunciation guide, although this is via a native French speaker, so you might sound a bit poncy in dinner table conversation.

So how much does this gem cost? The app is entirely free, although the advertising that allows this is a little aggressive – a banner ad is always visible on screen and frequent full-screen ads appear blocking use of the app until you tap their close button. On the other hand, this app is ultimately used for quick look-ups, so the advertising isn't all that intrusive.

Seafood Watch

We're not entirely sure what to make of this app. It's created by Monterey Bay Aquarium, which is based in California, and appears to promote conservation and marine sustainability. However, the purpose of the app is to let you look up what you're about to eat when visiting a seafood or sushi restaurant. Hmmm...

Look up cod, for example, and you'll see a short Wikipedia-like article about the history of the fish and how it came to be part of our diet. Yet above this are recommendations of the best places to source the fish, which is decided based on where the fishing took place and the sustainability therein. There are three categories: Best Choices ('well managed and caught or farmed in ways that cause little harm'), Good Alternatives ('be aware



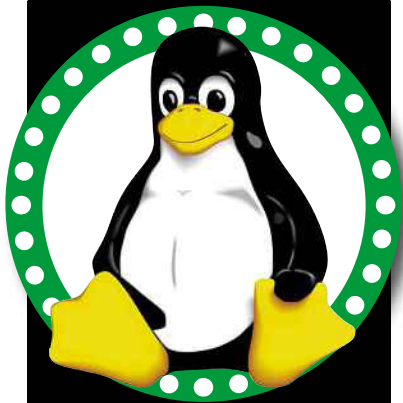
▲ *Seafood Watch* lets you look up the ethics of the seafood you're about to eat

there are concerns') and Avoid ('overfished or caught or farmed in ways that harm'). The app is US in origin and, unfortunately, assumes the rest of the world is also American. Therefore its top recommendation for cod is to source it from Alaska. This is tricky if you simply want an ethical fish supper in Bridlington. However, fishing is ultimately an international business (one of the most popular fish eaten in Britain, tuna, certainly can't be found off our coast), so a lot of the advice still holds. For example, going back to cod, we're told that a good choice are Marine Stewardship Council Certified Fisheries, of which there are several in the UK alone.

A separate section of the app shows information about sustainability in fishing and the techniques and science used.

Aside from the fact it feels odd taking advice about eating sea life from an agency supposedly in the business of protecting it, we reckon you'd have to be a pretty big fan of both seafood and ethical shopping to find this app useful. However, it's free, and the ability to look up the endangered levels (or not) of just about any marine life we humans consume is compelling in itself.

Notably, the app doesn't work on iPad, although there doesn't appear to be any reason for this lack of inclusion. [mm](#)



David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

Linux

Why Do You Use Linux?

A question for you all

This is a question that has been asked countless times among the group of old-school Linux users I'm proud to be a member of. Why do you use Linux?

For me, it's purely for work purposes. I use Linux for reviews, articles and projects that relate to Micro Mart or one of the other pies I have my digits in. Admittedly, beyond that, I rarely touch it.

It may sound like a strange confession for someone who writes the weekly Linux News page, but at least I'm being honest. I've never professed to be an expert on Linux, just a user who has been thrust – or volunteered, as many of you can appreciate – into making good a Linux installation for the company I'm working for.

To me it's an interesting problem to overcome, something to keep my brain ticking over and keep my hand in should I ever be called on to 'do' Linux in a more corporate setting. But it's also the getting your hands dirty, command line stuff that I like too. It reminds me of a time

when DOS 6.22 ruled the PC and people used their keyboards for something other than complaining and trolling.

A few friends of mine are very much the same: Linux keeps them thinking and retains an active interest in computing. One or two simply use Linux because they refuse to pay Microsoft anything, and all they do is browse occasionally, send an email or two, or watch BBC iPlayer or something. And they do this on a machine they built several years ago. So Linux works for them and fits the bill.

One of the group is particularly passionate about Linux; we jokingly refer to him as the militant wing of the local Linux user group. He uses Linux full stop and won't even bother with anything else. It's either Linux or nothing at all, and he often causes arguments with other non- or part-time Linux users. That's his prerogative, and he's harmless enough with it.

Over To You...

What I want to know, though, is what do you use Linux for? Do

you use it much the same way as me and the local group, or do you have a specialised need for Linux – something that only runs on Linux and not any other OS, for example?

Do you have any external hardware that you've used for years and for which only Linux offers the kind of user level experience needed? Or are you a developer and you contribute to Linux often? Do you have a Linux server that hosts websites or games? What kind of projects are Linux related and in use at home?

I'm not compiling a comprehensive list or anything; I'm just curious as to what other people want from their Linux experience.

So get behind the keyboard and send in an email to our esteemed editor (he loves receiving emails!) and let us know what you use Linux on, and for what and why you use it over another OS.

Until next week, folks.

▼ *I couldn't find a 'Keep on Truckin' Linux' image, so this will suffice*



Money, Money, Money

Craig Grannell on why it's great to see Apple championing apps that cost a pretty penny

Apple recently ran a campaign on the Mac App Store that caught my attention: "Start something new." The premise was that whatever you can imagine, you can bring to life using Macs, primarily through the many third-party apps you can run on them. (After all, I'm pretty sure even the most innovative of creators isn't going to be fashioning the next Hollywood masterpiece in TextEdit or Mail.)

The selection of apps was broadly impressive. Even though quite a few big names (most notably Adobe) remain absent from the Mac App Store, there's plenty there for all kinds of creative folk. Illustrators are well catered for by the excellent Sketch, and photographers have a huge range of products for editing their pictures, including Pixelmator, Acorn, Analog and Intensify. When it comes to time-based fare, musicians can delve into Logic Pro X, Capo 3 and DM1, while filmmakers can get stuck into Final Cut Pro, ScreenFlow and iStopMotion.

On looking through the listings, though, it wasn't the names that really stood out, but the prices, in that they remain reassuringly high. That's not to say that there hasn't been a general reduction in the cost of OS X software since the opening of the Mac App Store – because there has. Yet the expectation remains that if you want some high-quality desktop software, you still need to spend a bit of money.

So Sketch will set you back 80 quid – not a small outlay, although a comparative bargain compared to Adobe giant

Illustrator. Elsewhere, most of the feature-rich photo editors cost about 20 quid, while Apple's pro video and audio apps are a penny off of £230. Even the cheaper products in those last two areas mostly take a £20-plus chunk out of your bank account.

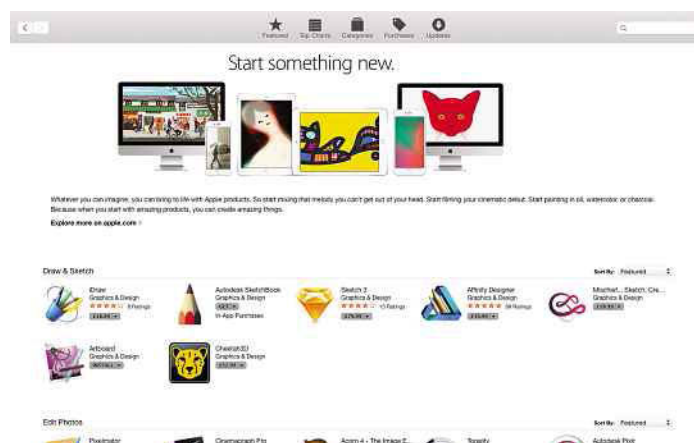
Given what's happened over on iOS, this is all quite heartening. On Apple's other App Store – for iPhones and iPads – the race to the bottom proved furious. In its earliest days, the likes of *Super Monkey Ball* and *Pac-Man*, respectively, arrived for eight quid and a fiver. Today, those would be considered insanely ambitious prices, reserved only for niche titles or those that are fairly direct ports of PC or console games. When it comes to apps, you so often see really great fare slugging it out, trying to convince punters to part with just a few quid.

Of late, it's become a thing for developers to reveal their earnings, and it often makes for sobering reading. When units sold across Apple's two platforms are roughly equivalent, earnings are anything but. Even

if iOS makes up half of all unit sales, it may pull in a fifth or less of the revenue.

The thing is, software takes time to create, craft and hone. Even apps that appear simple may require weeks or months of development time. If developers can't make money supporting their output, the fact of the matter is that they won't – apps will simply be abandoned as they move on to the next thing. Additionally, apps will become bereft of ambition and depth, because it's not worth spending huge amounts of time working on something that won't make any money. And from the consumer standpoint, there needs to be the trust that their investment will be rewarded accordingly, with bug-fixes, support and possibly updates.

That's why when I see Apple saying to start something new, I'm happy to see that the actual starting point is spending a little money. People might hanker for free, doffing their entitlement hat and moan about barriers to entry, but that's better than barriers being torn down, revealing everything beyond as an app wasteland full of garbage.



Craig Grannell is a writer, designer, occasional musician and permanent loudmouth. He's owned Macs since 1996, when Apple was facing certain doom, and is therefore pleasantly surprised by its current success. Find Craig on Twitter at @craiggrannell

Mac



Ian is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Mobile

Something Different

Ian McGurran finds that the most interesting things at MWC aren't always phones...

You'd think it a pretty good guess that the highlights of the Mobile World Congress would primarily come from the new mobile handsets exhibited therein. While that's mostly true for headline makers, some of the more exciting and impressive exhibits were something other than phone-shaped.

Lawnmower Men

It's been hovering around the periphery of technology for many years, a marker beacon along the path of man's technological achievements since the technological age came into being. After a few false starts, though, the age of true, effective virtual reality may just be flickering into life. What's more, it seems the mobile world will have quite a bit to do with it. Headlines at MWC came from an unlikely partnership between Taiwanese mobile giant HTC and digital games behemoth and occasional software developer Valve. Strangely, it was a VR headset, and even stranger than that, it got great reviews. Separating it from the Rifts and Morpheuses (Morpheus?) of the VR world, the weirdly monikered Vive uses something

Valve calls Lighthouses – essentially two small tower sensors that track the headset wearer in 3D space, not dissimilar to Microsoft's Kinect. Odd it may be, but the with Lighthouses making software specially aware of the player's location is what some are saying could well be the missing piece of the VR puzzle.

City of Lights

If VR has been around for ages, the connected home has been around even longer, from kitsch 50s visions of the future to occasional *Tomorrow's World* features, it's always been there and is finally coming to fruition. As long as we've been promised connected homes, connected cities haven't been far behind. This year, Philips demonstrated its CityTouch technology, a system that uses intelligent lights connected to a main 'brain' via the mobile network. It's a simple idea, but only now is the technology advanced and cheap enough for it to become a reality. Given that many British towns and cities are contentiously opting to switch off street lamps after midnight, it's this kind of technology that may not only keep the lights on and us safe but still make

the savings every council has to make. They may do well to knock on the Dutch giant's door.

Hard Drive

Yet another from *The Jetsons'* vision of the future, connected cars are also just round the corner. We're not yet at the self-drive stage, but its precursor is certainly here. Car dashboard technology has seemingly lagged quite behind the possibilities that current technology can offer. Many new cars still offer a relatively simple in-car entertainment and navigation system, no web connection for Spotify, no Google Maps sync, no Siri... It is changing, though, with Apple and Google announcing car versions of their technology in the past, and now Audi jumping in with its connected cars. These offer navigation and in-car wifi, fuel price alerts, weather, voice activation and even a touch of Google integration with Google Voice Search.

Given most mobile phones for under £100 are smarter than the average car, and car technology charges high prices for middling hardware, it's frankly about time they began to get with the rest of the mobile world. If anything, better mobile integration can help make cars much safer and smarter, just as long as the big names realise that going with Apple, Google or even Microsoft will probably reap greater rewards than steadfastly sticking to their proprietary technology that they can charge a hefty premium for....

So MWC once again demonstrates the ever wider reach of mobile technology. Year on year it makes its way into other areas, and as we've seen here, made for some very interesting and exciting developments. The future may finally be beginning to look like 'The Future'...



For The Love of Gaming

Andrew Unsworth frees himself from a self-imposed prison of guilt and pens his first epistle to the Consolites

I believe it was St Paul who once said something along the lines of "When I was a child I spoke as a child, I understood as a child and I thought as a child, but when I became a man I put away childish things." I've been troubled by this saying for many years. Not because I still lick bins and ride my dog round the estate like a donkey (my dog died years ago). No, my main concern with St Paul's utterance is that he's clearly insinuating that anyone who still clings onto the stuff we enjoyed when we were little instead of grumbling about the price of celery and lightbulbs is clearly not a proper grown-up. This troubles me because, of the many things I loved as a child and still do, I can't stop loving computer games.

In much the same way that I no longer feel the need to poke a steaming-fresh turd with a stick, I've learned to suppress the urge to buy the latest AAA blockbuster

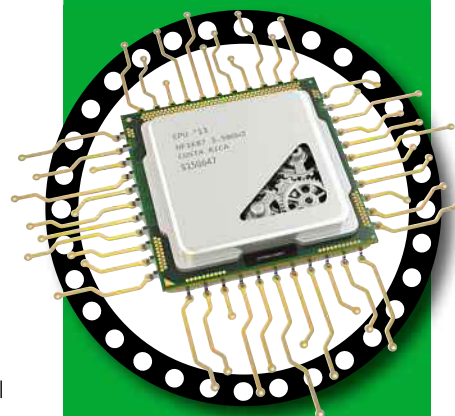
and lose the next three months in a silicon-induced torpor. However, thanks to a recent event, I no longer feel the guilt I once did. Having been reluctantly left alone with somebody else's small boy, and not knowing what to do with him, he suggested I let him loose on my games consoles. Oddly, it's only when an impressionable infant asks "What's a zombie?" that you realise much of your games collection involves either 'popping' a 'cap' in someone's bottom or redecorating the walls of a dead city with the contents of some poor chap's skull.

Thankfully, the games on my Nintendo Wii proved less visceral, so I took the wee lad on a trip through gaming history, letting him sample the delights of *Donkey Kong Country*, *Super Mario Bros 3*, *Ghouls and Ghosts* and even *Super Monkey Ball Banana Blitz*. He absolutely loved it, and I remembered that far from

being the preserve of anti-social thugs and nutters, gaming is a social pastime that introduces an interactive element to humanity's age-old tale-telling tradition. It creates and reinforces social bonds, it moves society forward, and it makes rich multi-national conglomerates even richer. It's clearly a force for good, not ill.

A sincere love of computer and/or videogames is nothing to be ashamed of. I'll be the first to admit that I can get addicted to games, but only rarely these days, and I honestly think any criticism of gaming is ignorant snobbery. I say don't feel guilty about gaming. Dig out your old consoles or buy a PS4 or Xbox One, but get your mates and family involved and have fun.

That concludes my sermon for today. Please remember the retiring collection on your way out; it takes notes as easily as it takes pennies.



Andrew Unsworth has been writing about technology for several years, he's handy with a spanner, and his handshaking skills are second to none

Hardware





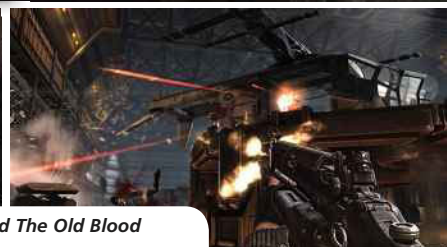
Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*



Shoot To Kill



Set 14 years before the events of *Wolfenstein: The New Order*, a prequel called *The Old Blood* sees BJ Blazkowicz fight the Nazis in a violent two-part mission



This week, Ryan checks out a *Wolfenstein: The New Order* prequel called *The Old Blood*, and takes a look at Epic's free-to-play *Unreal Tournament*...

Plug & Play

As the first-person shooter has evolved, the game that helped start it all – id Software's *Wolfenstein* – has clung on tenaciously. The mainstream may have long since moved on from World War II and Nazi blasting, but the *Wolfenstein* series has continued to pop up every few years, offering up its own fantastical reading of history.

Released last year, *Wolfenstein: The New Order* wound forward to an alternate 1960, where the Nazis had won the war and series hero BJ Blazkowicz fought against Third Reich robots and other outlandish enemies. Created by developer Machine Games, *The New Order* suddenly made the ageing *Wolfenstein* seem fresh and relevant again.

For anyone enjoyed that last entry, there's good news: Bethesda has announced *Wolfenstein: The Old Blood*, a stand-alone prequel to *The New Order*. Turning the clock back to 1946, where the Nazis are on the cusp of victory, *The Old Blood* sees Blazkowicz engage in a two-part mission deep behind enemy lines in Germany.

The first part of Blazkowicz's mission – going under the

magnificent title *Rudi Jäger and the Den of Wolves* – sounds like a step back to the grand old *Wolfenstein 3D*: the story takes place in the gothic environs of Castle Wolfenstein, this time rendered in gritty 21st century detail. A new gameplay trailer (youtu.be/fxVEpo_35sA) shows off some of the things we can get up to within the castle walls – activities include hammering what looks like a tent peg into a guard's neck (a less-than-subtle stealth kill, we're guessing), engaging in *Where Eagles Dare*-like shoot-outs on moving cable cars, fighting armoured soldiers while wielding two machine guns, and avoiding rounds from hovering drone-type things. It's about as faithful rendering of World War II as *Raiders Of The Lost Ark* – which is, of course, all part of the fun.

The Old Blood's second mission will probably be shown off in more detail at a later date, but we know from Bethesda's announcement that it has a title – *The Dark Secrets of Helga Von Schabbs* – and that it will see Blazkowicz hunting down a Nazi archaeologist hoping to find old relics that could "threaten to unleash a dark and ancient power."

Given how effective *The New Order* was at mixing fast-paced, old-school shooting with modern graphics and an entertainingly outlandish – sometimes quite disturbing – story, *The Old Blood* should be well worth looking forward to.

Wolfenstein: The Old Blood is out on the 5th May.

Online

One of the big stories to emerge from this year's Games Developers Conference was that Epic is making its Unreal 4 engine free for developers – albeit with the minor caveat that you still owe the developer 5% of your profits once they break a \$3000 threshold (or roughly £1995 in old money). The rise of Unity, it seems, is putting pressure on rival engine makers to release their own services for free; at the same event, Valve has announced that its own proprietary engine – Source 2 – will also be free to use.

While not everyone has the time, skill or inspiration to create their own games from scratch with something like Unity or Unreal, their availability is what's made PC gaming so vibrant and community-focused. Keenly aware of this, Epic also



Unreal Tournament's looking better than ever high-res map shows off the online shooter's potential

made GDC the venue for an update on its brand new *Unreal Tournament*, a game which is itself partly constructed by a loyal community.

Unreal Tournament's still in alpha, but as a new trailer (tinyurl.com/oyc7n7c) reminds us, it's already looking quite special. Showing off a new map called Outpost 23, the footage provides a glimpse of how the new *Unreal Tournament* revives the deliriously fast-paced shooting frenzy of its predecessors. Where most shooters have looked very grey and austere in recent years, UT positively leaps from the screen with multi-coloured laser fire, brightly lit open spaces and bodies exploding in puffs of pink mist. Best of all, UT's dodging and jumping's back with a vengeance, too.

The best news? *Unreal Tournament's* not only free, but also available to download already. The idea is that, while the game's still in its alpha stages, you can still play what's ready so far as additional maps and textures are added in the coming months. Also, with a new Unreal Editor now in place, it's easier than ever to get involved and help the game's community build maps and other content.

You can find out more about *Unreal Tournament* over at www.unrealtournament/blog.

Incoming

The *Metal Gear* franchise has sneaked around in plain sight for almost 30 years now, beginning as a 2D game for the MSX before leaping to the world's attention in the PlayStation era. Even as the series has moved with the times, *Metal Gear* creator Hideo Kojima's consistently claimed that he's handing the role of director on to someone else.

Kotaku recently compiled a list Kojima's proclamations about ending his involvement in *Metal Gear*, and they make for amusing reading; they go as far back as 2000, when he said he'd be moving on to new things after *Metal Gear Solid 2*. Since then, each and every entry has supposedly been the last hurrah for Snake and his creator – and Kojima's now saying that, with *Metal Gear Solid 5: The Phantom Pain*, he's "finally closing the loop on that saga."

"In that sense," Kojima told IGN, "this will be the final *Metal Gear Solid*. Even if the *Metal Gear* franchise continues, this is the last *Metal Gear*."

Around the time of that interview, *The Phantom Pain's* release date leaked: we now know it'll be out on PC on the 15th December. Does this really mean we've reached the end of Snake and Kojima's near three-decade relationship? Possibly, but probably not.

► *Metal Gear Solid 5* is "finally closing the loop on that saga"



Trine 3

Frozenbyte's *Trine* games look like a platform puzzlers made with the budget and detail of a *Warcraft* or *Diablo* sequel - *Trine 2*, in particular, was arguably one of the prettiest games the genre's yet seen. So it's exciting to hear that the franchise's Finnish developers have announced *Trine 3: The Artefacts Of Power*, and that it looks even more beautiful than its predecessors.

The side-scrolling, 2.5D platform-puzzling's present and correct, but the quality of the character animation has even more flow and realism. The announcement trailer (youtu.be/0tS05xEHKbQ) shows off some of the game's new locations, and introduces



an adorable-looking non-player character who looks a bit like the caterpillar from *Alice In Wonderland* without the narcotics addiction. *Trine 3's* scheduled for release this year.



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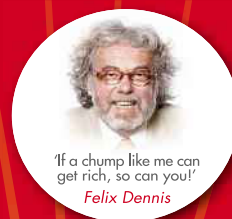
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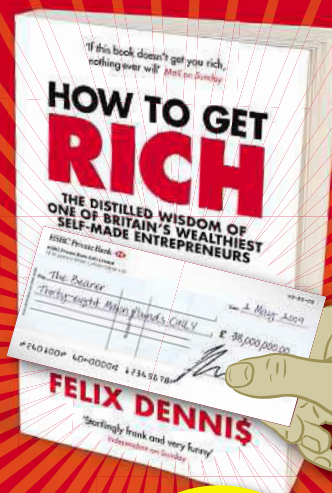
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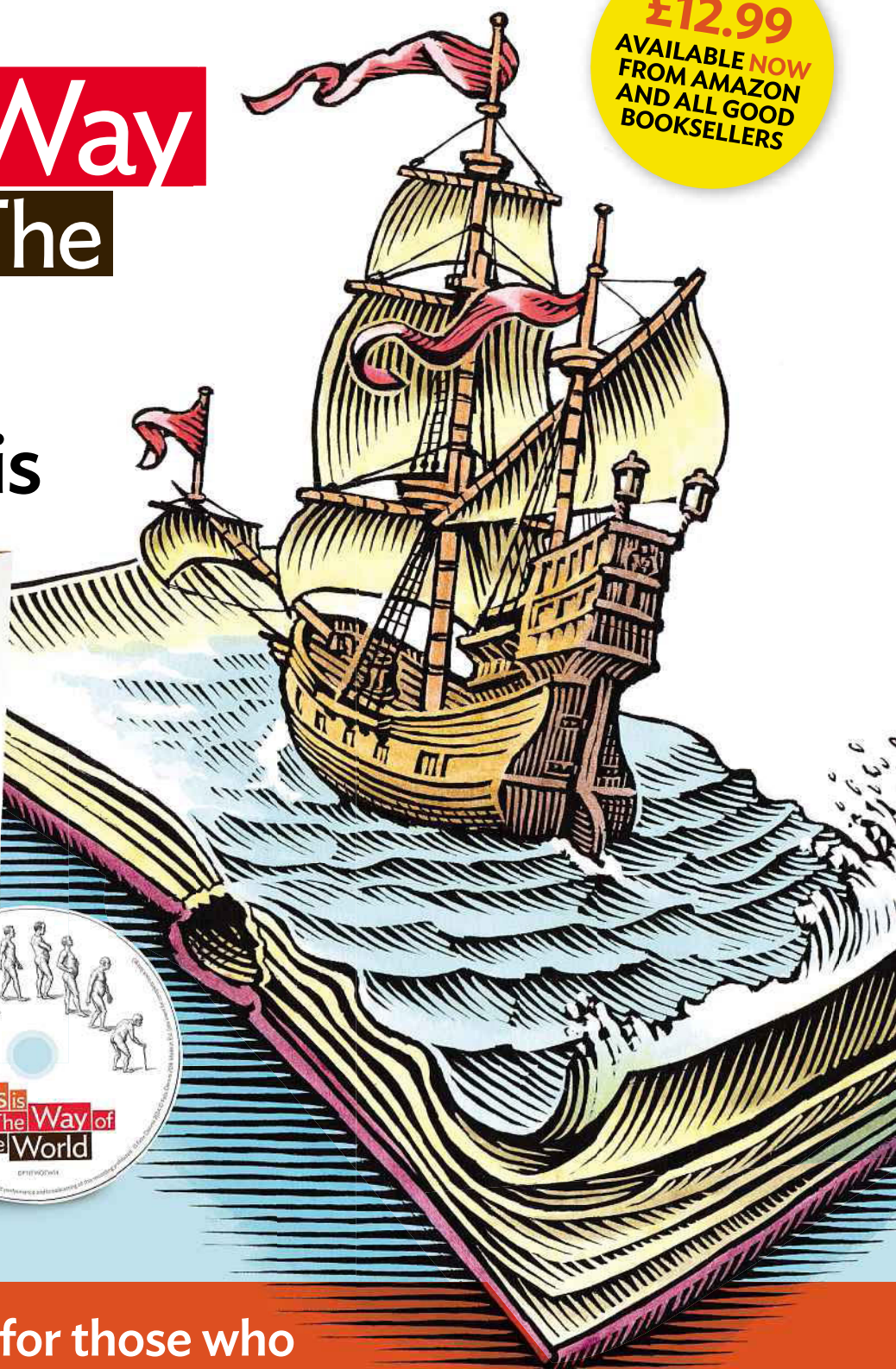
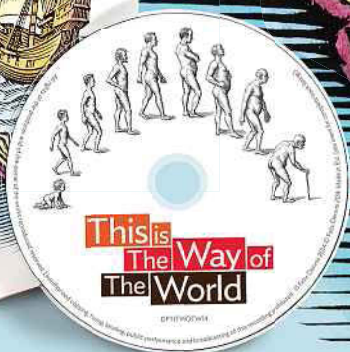
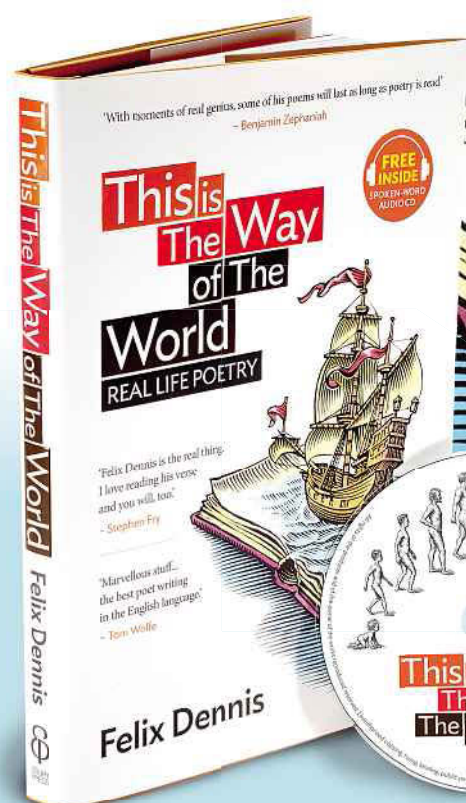
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Please try to keep your queries brief and limit them to just one question per letter, simply so we can squeeze in as many as we can each week. Please include relevant technical information too.

Aaron

8 + 10 = 2 Problems

I have been a user of Windows for many years now, having loved XP, tolerated Vista and, presently still adoring Windows 7. I currently have a mix of four 1TB HDDs in my PC. I use one for all my computing, games, watching movies, Internet, office, etc, a second for storage, such as movies, books, music, etc, a third one for backups, and the fourth for trying out stuff such as Linux, new software, or more recently, attempting to try out the latest Windows version (8.1, and the recent trial release of Windows 10). Basically I am a desktop user (very occasionally I go over to a laptop) and I do not envisage myself ever using a smartphone, tablet, touchscreen, etc.

To date, I have always liked the fact that, if I feel like doing a fresh install for whatever reason, I can reinstall my Windows operating system in its entirety; pausing only to insert user name, locale, date and time before I'm up and running. My desktop appears and I can then re-install all my security programs and any other software I regularly use, reset my e-mail accounts in Pop Peeper and I'm done. Easy peasy. Even easier if I do it from a backup or disk image.

▼ *Windows 8.1 can be set to bypass the Metro menu, and has a simple Start Menu*

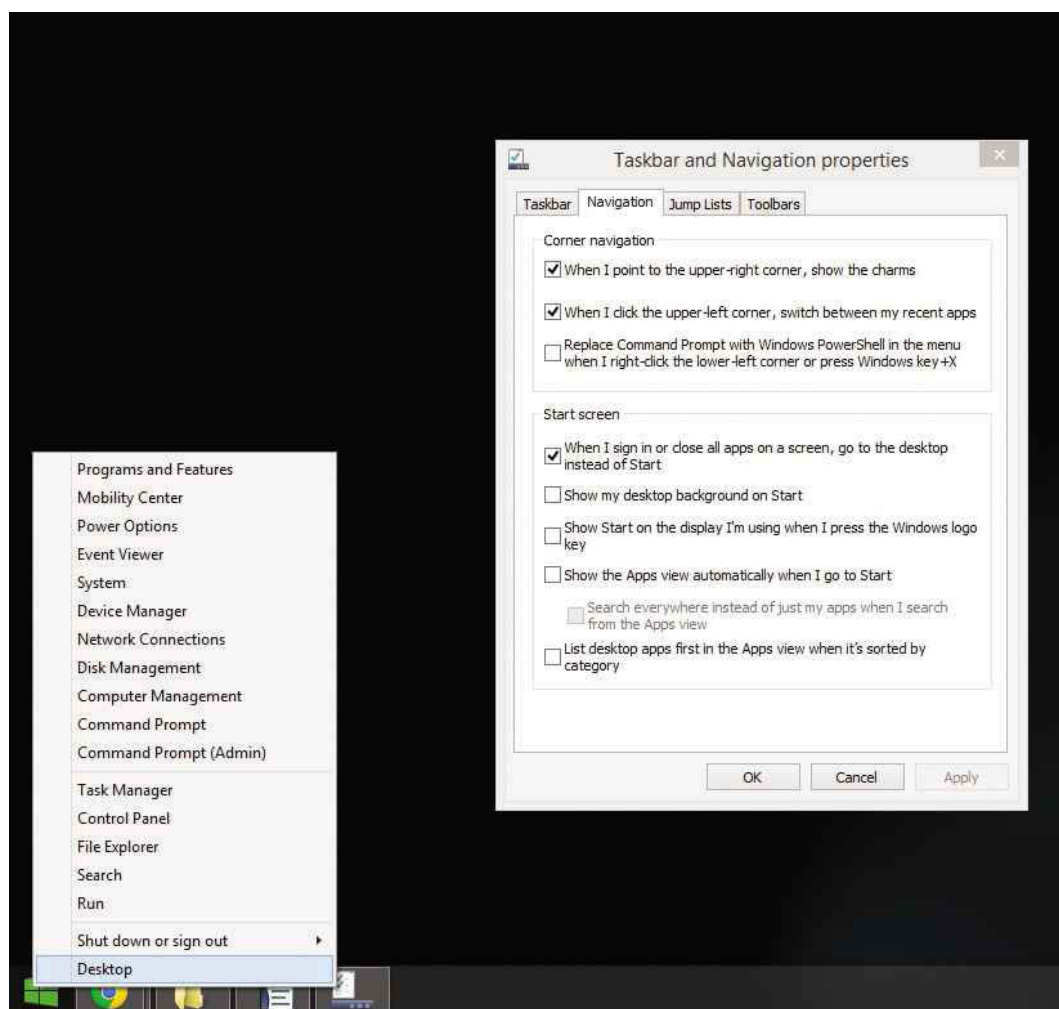
My problems, then, arise from Windows 8 onwards. There are two main problems in fact.

Problem 1

Neither Windows 8, 8.1 or 10 will allow me to complete installation of the OS without the setting up of a Microsoft or Local account. This I do not want, need or require. In fact, I regard it as an intrusion. It is not a security measure, and I do not want to be synced to anything else. If my desktop requires a log in and/or password I will give it one when my OS is set up, if and when I deem it necessary. I do not need to be synced to the Cloud, nor will I use Apps, but should I decide to do so or decide to enter Microsoft's Store, then, and only then will I set up an account for that purpose and that purpose only.

In order to try out these new Windows installations I had to go to the bother of setting up this account for trial purposes and to my dismay, I found, that when up and running, certain things I tried required the repeated entry of the account name and password. Exceedingly annoying and, I believe, intrusive.

I wish to be able to load my OS in its entirety without setting up any accounts so that when



I boot up I am immediately met with my desktop and my programs. If my desktop requires a log in and/or password I'll pick them then.

Problem 2

While I am well aware of Classic Shell and the variety of Start Menu programs (most helpful), the Windows 8 tile screen was a disaster, but after some googling it wasn't too difficult to work around. I notice in Windows 10, that the new Start Menu is a mix of the old style Start Menu and again, more unwanted tiles. I would rather just have the old start menu and be able to completely rid my PC of tiles.

Having run Windows 8.1 and 10 (trial) virtually, apart from the above mentioned problems, they didn't seem too bad, and I would in fact like to give them a good try out. However, if I decide to actually install Windows 8 or 10 (when it's released) on my PCs, will there be a way to completely remove these tiles and have my desktop more Windows 7-like? I know change/evolution is supposedly good, but these changes are most definitely not. In fact I find them nothing less than annoying in the extreme.

Second, and more importantly, can you advise if this requirement to set up an account, Microsoft, Local or otherwise (or you won't even be able to complete the install of the OS) is likely to remain in Windows 10's final version, or is there, or will there be a workaround?

Zebidee

Microsoft, like many other software manufacturers, is taking more and more steps to unifying its software and services, and there's a very real push for the use of cloud storage. This is either a good, or a bad thing depending on your own opinion on the use of remote storage. Cloud services are very useful, and there are many reasons why we use them, but I understand your hesitation, and you're certainly not alone.

Both Windows 8 and Windows 10 utilise user accounts, be they local or Microsoft, and you do need an account to log in. However, you don't need to create an online Microsoft account, and there are ways around it, leaving a local account as the only option. This kind of account is not online, and your data isn't synchronised

to any external servers. It's limited locally to your PC, so there's no reason to worry about cloud storage.

The simple way to bypass the Microsoft account is to unplug your network cable, or deactivate wi-fi. This will cause the installer to bypass the Microsoft account setup as it won't be able to connect to the Internet. This leaves the local account as the only option.

Alternatively, you can select the option to 'Sign in without a Microsoft account' when asked to create a new account. This will have the same result, and you can then create a local user account instead. You can also enter fake information into the Microsoft account details (such as a garbage email address and password), which will cause the account registration to fail with incorrect logon details. This will then give you the option to continue with a local account.

As Windows 10 is not yet available, I can't say for sure that these methods will work in the same way, but as they're fairly simple, and relate to connectivity or password accuracy, I'm fairly certain the same tricks will work.

As for the new Metro menu and its tiles, these aren't going away I'm afraid. Despite a lot of negative feedback, Microsoft has only altered their use, moving them to a more traditional Start Menu configuration, but they're still there.

If you're really keen to avoid the tiles, there are two good ways around them. The first would be to use Classic Shell (www.classicshell.net), which you already know about. This is by far the best way to alter Windows 8 and bend it to your will. It can completely eliminate the Metro menu, and re-introduce a classic style Start menu instead.

If you're not all that bothered about the actual Start Menu, and simply want to bypass the Metro menu and its tiles, there's an even easier answer. Upgrade Windows 8 to 8.1 and right-click on the Task bar when at the Desktop view and click Properties. Select the Navigation tab and place a tick next to the option 'When I sign in or close all apps on a screen, go to the desktop instead of Start.' This will force Windows to boot directly to the desktop view, so you'll only see the Start Menu if you manually navigate to it. You can even use a small Start Menu of a sorts by right-clicking in the bottom-left corner.

< Classic Shell is one of the most popular, and effective ways to change the way Windows' new interface functions



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Jason

It's All Greek To Me

Thank you for your reply in issue 1391, where you advised on my OCZ Vertex 2 SSD, which had died without warning. I've now bought a Samsung 850 Evo, as reviewed in the magazine a couple of weeks ago.

I've also decided to downgrade the OS from Windows 8, as I'm unable to upgrade to Windows 8.1 – apparently, my Athlon 64 X2 4200+ doesn't have the right features. However, the new installation halts part-way through and asks for a media driver. I've no idea what this means. I don't have a 'media driver'. A post on a forum suggested it was something to do with the AHCI setting in the BIOS, but I can't find any such setting. In fact, it's difficult to find anything at all, as much of the text in the BIOS appears to use the Greek alphabet! What's that all about?

Francis Kinsler, Gmail

Random characters in place of readable text is a classic symptom of corruption. Disconnect everything from the motherboard not needed to get the PC to boot. Drives, peripherals, expansion cards – remove 'em. Try each RAM stick in turn. Pull the graphics card, too, if the board has graphics

of its own. Afterwards, do you still need the Rosetta Stone to interpret the BIOS settings? If not, trial-and-error should reveal the faulty component. I'd place my bet on the graphics card.

However, if you're still considering a trip to Smith's for a foreign-language dictionary, perhaps the board's BIOS needs re-flashing. Visit the relevant web page, grab the latest BIOS file and the necessary flash tool, and follow the given procedure. Clearly, a Windows-based flash tool won't be any use, so use whatever DOS-based tool's on offer. You'll have to run this from a CD, floppy, or USB stick (if the board supports USB booting). If that doesn't help, Francis, the board's knackered.

*Assuming you've moved forward, though, what OS are you trying to install? It rather sounds as though it's XP. Does setup fall over at the point it tries to access the SSD? To make the most of an SSD, and to get TRIM working, it needs to be running in AHCI mode, not IDE or legacy mode. There *will* be an option for this in the BIOS – if you can read it! Vista and later support AHCI-connected drives by default, but XP requires a driver during setup (for both SSDs and spinners).*

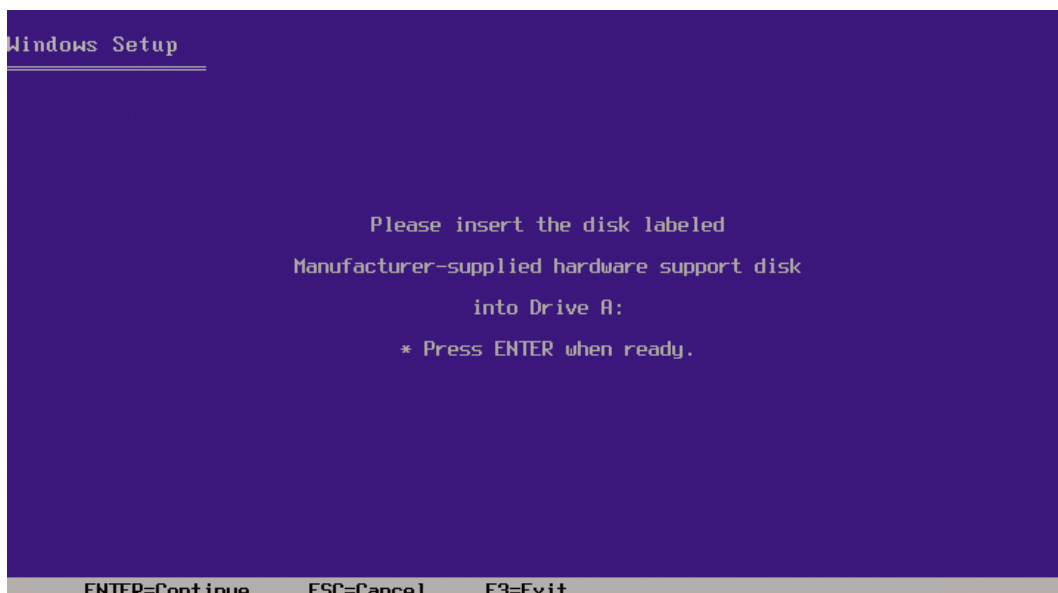
Sadly, this driver can only be installed via floppy (or, with effort, it can be slipstreamed into a custom setup CD).

You'll find the driver on the motherboard's web page. If you don't have a floppy drive and can't beg or borrow one, your only easy get-out is to run the SSD in IDE mode. It'll work and work well, but you'll probably run into garbage-collection issues and find a complete Windows reinstallation becomes necessary after six or 12 months.

Really, of course, you shouldn't be using XP. The proper solution here is to run Vista or later. A Vista product key, or even a Windows 7 product key, can often be acquired cheaply through buying an old, faulty laptop off eBay – maybe £10 or so. In theory, such a key won't be transferable, but in practice it almost certainly will be.

*Now, if you're *not* trying to install XP – if you're already on the road to Vista or Windows 7 – I'm afraid I'm at a dead loss. I can't imagine why setup is baulking at the lack of a 'media driver'. It could well be another symptom of a faulty motherboard, especially if you've been unable to solve the problem with the hieroglyphics. Have any other readers got any ideas?*

▼ **It's a few years since I last saw this!**



The Price Is Right (Even When It's Wrong)

I'm a regular buyer on eBay and something's been bugging me for ages. Quite often when searching I'll come across an item that's got a stratospheric price. For instance, I've been looking for case fans, and one seller right now is asking £906.79 for an 80mm job from Arctic. Yes, for **one** fan! Why do sellers do this? Is it a ploy to make a fortune from an unwary or trigger-happy buyer? That can't work, surely, as the buyer would never pay. I don't get it.

William Anderson, Virgin Media

To sellers, this sort of carry-on makes perfect sense, but to buyers it just looks like madness. If you're a seller and have an eBay shop (shops start from £19.95 per month), your Buy It Now listings can be set to run for ever or until you run out of stock. This is the Good 'Til Cancelled option. It's ideal for someone who sells a lot of the same item.

Buy It Now listings with lots of sales appear very high in eBay's default searches – even above listings offering the same item cheaper (but with fewer sold). Naturally, no seller with such a listing wants it to end (some run for years), as that would mean having to start a new listing with zero historical sales. That listing would appear on page 346 in a search.

Therefore, Will, if a seller runs out of stock but knows more's on the way, it's essential to keep the stock level above 0 (else the listing will end) but also to ensure nobody will actually hit the 'buy' button. The answer is to specify a ridiculously high price. Once new stock arrives, the price can be put back to where it belongs. So now you know!

▼ £906.79 for a case fan? Why? Why?!



Port Short

I own a Lenovo IdeaPad Z580 laptop. Somehow the charger port has broken or at least been pushed inside the chassis. Now the battery's run out, the laptop's useless. Can the charger port be repaired or replaced? The laptop's only eighteen months old and cost £600. I'm not sure how the problem occurred, but I suspect an energetic niece or nephew came into the equation somewhere!

Jo, London

back in. If the fixing points have broken, a dab of superglue should do the trick. If the port was originally soldered, it would be best to solder it back, but soldering is quite a skill. Better to ask someone who knows what's what – or use the services of a local computer shop. If you've disassembled the laptop and are willing to put everything back together, it might only cost a tenner.

If the port's actually broken, Jo, you'll need a replacement. By the looks, that'll

set you back the grand sum of £5.95 on eBay (including delivery). See here: <http://bit.do/2kfC>. The non-port end of the cable is a plug that clips into a socket on the motherboard. Simple. Again, if the port itself needs to be soldered in place, don't attempt it yourself unless you've got magic hands.

▼ Broken or pushed-in laptop charger ports can usually be fixed pretty cheaply and easily

I've not had hands-on experience of the Z580, but your best bet when something needs fixing is to hit YouTube. Pound to a penny chew (Black Jack or Fruit Salad?) you'll find a tutorial. If the cupboard's bare for the exact model in question, there'll usually be a tutorial for a model close enough that makes no difference.

Point your peepers at this: <http://bit.do/2j53>. Oddly, there's no audio, which is a shame – often the audio's as useful as the video (but not when it's some mind-destroying dance track). As expected, the first task is to remove most of the screws from the Z580's base. The keyboard can then be unclipped. After that, the top part of the chassis can be lifted off, giving access to the laptop's guts. Thankfully, there's no need to detach the screen.

The charger port is on a flying cable, and if the port's simply slipped out of position, it should be the work of a moment to slot it



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If the technology industry can be said to do one thing, it's making better designs for smarter living. These Kickstarter projects take that to heart

iRBeacon

From TVs to music systems to set-top boxes and DVD players, the parade of remote controls in the average living room is getting a little ridiculous. You could buy a single universal smart remote, but the upshot then is that you have yet another remote control hanging around! If that sounds like a familiar situation, you may need the iRBeacon.

This tiny device combined an Infra-Red sensor with low-power Bluetooth and your smartphone to create a fully-customisable remote control capable of controlling any device with its own IR sensor. Furthermore, connectivity with smart hubs and mesh networking means that you can control your devices from anywhere in the world, and even set them to shut off automatically when you're not nearby.

Although it officially supports hundreds of devices, the App comes with learning features so that you can use your existing remote to 'teach' it and add support manually. All you need is an iOS or Android smartphone to run the software, and a single watch battery to power the device (it will last about a year, we're told).

Early bird tiers have sold out already, but it's still only a fraction of the cost of most IR remotes – a single unit will cost you £18, and can control up to four devices, or you can get two for a discounted price of £16. With a month to go its £5,000 target seems modest and more than achievable, so get in line!

URL: kck.st/1wH4kl9

Funding Ends: Friday, April 17th 2015



Sesame

The idea of turning access to your house over to a keyless, wireless-based system might sound like madness, but with a device like Sesame, it might just be the future.

All you need to lock and unlock your door is your phone and the required app. A custom knock serves as a code to ensure no-one but you can use your access privileges, and you can enable anyone with the phone and app to take advantage of the system, complete with time-limited access credentials and a log of who's activated the lock, and when.

Sesame is easy to install and works with any single-cylinder deadbolt lock. Powered by a 500-day rechargeable battery, you get a notification when the battery is low so there's no worry that it'll suddenly deactivate when you're out of the house. Bluetooth and wi-fi capabilities combine with your custom knock to serve as an unlock key, and can automatically lock your house if you go out of range. However, if any of this sounds like it might be a problem, you can still use your key to get in! Sesame complements, rather than replaces your existing system, which makes trying it out a bit less worrying.

You may still be able to become an early bird backer by the time you read this, meaning it costs you just \$99 (£65) off the regular RRP against the \$149 (£97). And if you do pay \$149, you'll at least get the wi-fi access point free, saving \$50 (£33) off the RRP.

URL: kck.st/1K3KkVV

Funding Ends: Sunday, April 26th 2015



Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

David Hayward embraces capitalism and makes huge profits

Logging Off

This week, a well-known memory module maker dropped me an email to enquire if I was covering DDR4 technology yet. My reply wasn't positive because at this point I don't own a computer that can use this memory technology.

That's not especially surprising, because unless you're willing to throw wads of cash at Intel for an LGA 2011-v3 processor and buy an expensive X99 motherboard, then this isn't a memory type you will need yet.

However, the whole industry is gearing up like it is about to go mainstream, with not the slightest indication that the PC market is in the mood to do go there.

The critical component in this master plan to make obsolete perfectly good technology for new and incompatible stuff is codenamed Skylake. That's Intel's architectural replacement for Broadwell, which the current LGA 1150 processors use, which previously elbowed Haswell.

There isn't much point putting an LGA 1150 socket on Skylake, because the processors for this series won't support DDR3, only DDR4, so older chips will be incompatible even if they fit in there. The 100 Series support chips 'Sunrise Point' will all be required.

At this time it is expected that the first Skylake systems will appear in Q3, though frankly I'll be amazed if many are sold this year given their likely price premium over existing hardware.

Why? Well, my current desktop system is a Haswell-based rig that I built 18 months ago, using the LGA Intel Core i5 4430. That cost me roughly £150, almost exactly the same price that it costs today, curiously.

Where the cost of SSDs, video cards and flat displays has reduced over that time period, Intel has put its products in a protected price bubble, it appears.

Its logic, it seems, is that if demand is low, it's better to gear down production or stifle releasing chips to maintain the cost rather than cutting the price. That makes sense, right up to the point that you've got a new generation coming, and then you've got a big problem.

For Skylake systems to flood the market, you first need to get all the Broadwell stock out of it. You also have to convince a less than enthusiastic market that the new stuff is worth paying extra for, along with new motherboards and new memory.

EDITORIAL

Editor: Anthony Enticknap
theeditor@micromart.co.uk

Designer: Kevin Kamal

Bonus John: John Moore

Contributors: Mark Pickavance, Shaun Green, Jason D'Allison, Joe Lavery, Sven Harvey, Simon Brew, Shaun Bebbington, Ryan Lambie, James Hunt, Mark Oakley, Ian Jackson, Roland Waddilove, Basil, Oregano, Garlic, Sarah Dobbs, David Hayward, Leo Waldock, Ian McGurran, Aaron Birch, David Briddock, Ian Marks, Craig Grannell, Kevin Pocock

Caricatures: Cheryl Lillie

ADVERTISING

Group Ad Manager:

Andrea Mason

Tel: 020 7907 6662

andrea_mason@dennis.co.uk

Sales Executive:

Finan Tesfay

Tel: 0207 907 6898

finan_tesfay@dennis.co.uk

Sales Executive:

Karl Taylor

Tel: 0207 907 6706

karl_taylor@dennis.co.uk

US Advertising Manager

Matthew Sullivan-Pond

matthew_sullivan@dennis.co.uk

MARKETING

Marketing Manager:

Paul Goodhead

Tel: 0207 907 6393

PRODUCTION

Production Assistant:

Maaya Mistry

0207 907 6079

maaya_mistry@dennis.co.uk

Digital Production Manager:

Nicky Baker

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micromart@servicehelpline.co.uk

NEWSTRADE SALES

Newstrade Director:

David Barker

DENNIS PUBLISHING

Group Publisher:

Paul Rayner

paul_rayner@dennis.co.uk

Managing Director:

John Garewal

Group Managing Director:

Ian Westwood

COO: Brett Reynolds

CEO: James Tye

Company Founder: Felix Dennis

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The first signs that this switchover is pending will come when the cost of LGA 1150 processors are slashed, and at this time I can see no evidence of it. I'm also in no rush to trash my perfectly working rig to replace it with a marginally better one, as I'm not a charity fundraiser for Intel.

So at this time my view is that I'm not covering DDR4 until it proves to be popular, in demand, and available on typical PC systems. That might change as it did with DDR3, but it never did with Rambus RIMMs, so it isn't guaranteed.

Ignoring that I'm a tech journalist for a moment, given a modest budget I'd rather spend that money on a better Broadwell CPU than to plough that into a very low-end Skylake, entry-level motherboard and memory.

On that basis, I'm certainly not doing DDR4 now, and I honestly doubt that I'll be doing it for the foreseeable future.

Even I need more justification than Intel declaring 'It's new!'

Mark Pickavance

LAST WEEK'S CROSSWORD

Across: 7 Spaceship Away, 8 Uncial, 9 Saitek, 10 Azimuth, 12 Ofcom, 14 SPOSH, 16 Ragtaps, 19 Astral, 20 Druery, 22 Parkinson's law.

Down: 1 Open, 2 Schism, 3 Isolate, 4 Miasm, 5 Tariff, 6 Hale-Bopp, 11 Zipfs Law, 13 Sandbox, 15 Strike, 17 Truism, 18 Plan B, 21 Roam.

DISCLAIMER

The views expressed by contributors are not necessarily those of the publishers. Every care is taken to ensure that the contents of the magazine are accurate but the publishers cannot accept responsibility for errors. While reasonable care is taken when accepting advertisements, the publishers cannot accept any responsibility for any resulting unsatisfactory transactions. Well, it seems Jeremy Clarkson has been putting his foot in it again. Or should that be his fist? Honestly, we're not sure, because details have been sketchy so far, but what we do know is that he was suspended for his involvement in a fracas with a producer. Frankly, we couldn't give two hoots about what probably amounts to

handbags at dawn, but the word 'fracas' – now that's interesting. Is it just us, or does it sound like some kind of Spanish food? We're thinking maybe a kind of pancake. Well, it does to us, if pronounced the British way anyway, rather than the American: so 'frak-ah', rather than 'fray-cus'. Ah, those crazy 'muricans and their weird pronunciations – not to mention how they use different words to us for all kinds of things. Like we say 'jelly' and they say 'jello'. We say 'trousers', they say 'pants'. And what everyone else calls an 'invasion', they call 'liberation'. It's a funny old world, isn't it? But it's the differences that make life fun, so they should be celebrated. We wonder what Jeremy Clarkson would say about all this. Well, on that bombshell...

THIS WEEK'S CROSSWORD

Across

7 Linux command line utility that searches for lines of text that match one or many regular expressions. (4)

3 Based on or told of in traditional stories but lacking factual basis or historical validity. (8)

9 An e-mail and personal information management software product from Microsoft. (7)

10 One of the two branches of the family of languages spoken in Hungary and northwestern Siberia. (5)

11 Matte that has 74% copper. (7,5)

13 Something that exists by itself, although it need not be of material existence. (6)

15 Used to embed another document within the current HTML document. (6)

17 The act of freeing businesses from excessive government rules and restrictions. (12)

20 An optical device that produces an intense monochromatic beam of coherent light. (Abbreviation) (5)

21 Satya: Microsoft Corporation's CEO. (7)

22 This Apple OS upgrade promises a completely new relationship between your Mac and iOS devices. (8)

23 Superseded Microsoft's FAT file system. (Abbr) (4)

Down

1 Brash magazines printed on high-quality smooth shiny paper. (8)

2 In addition to what is usual or strictly necessary. (5)

4 Someone who talks incessantly and tiresomely. (6)

5 A speculative scheme that depends on unstable factors that the planner cannot control. (5,2,5)

6 An intelligent personal assistant on Windows Phone 8.1. (7)

7 The set of all points or lines that satisfy or are determined by specific conditions. (4)

8 States that any problem in NP can be reduced in polynomial time by a deterministic Turing machine to the problem of determining whether a Boolean formula is satisfiable. (5,7)

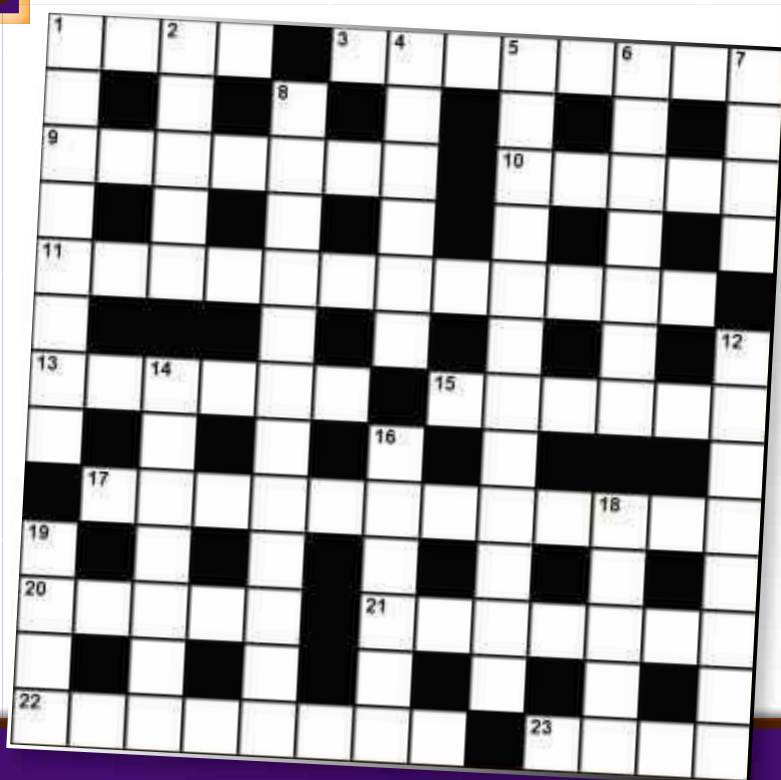
12 A large cushion filled with polystyrene beads and used as a seat : often found in 'progressive' workplaces. (8)

14 Those who believe in the existence of a god or gods. (7)

16 A logical, visible subdivision of an IP network. (6)

18 An opening through which a fluid is admitted to a tube or container. (5)

19 Google's Android app store. (4)



The Things That Frustrate Us About... Flickr

Don't you sometimes just hate Flickr?

Usually, this column is about a site or service or technology that, despite being a bit annoying, we still use on a daily basis. This time, though, it's slightly different. Because Flickr has been annoying enough over the years, that we've almost given up on it.

The Yahoo buyout was a sticky time; there was the whole debacle over users' photos being sold as canvas prints (without their permission); and the site's been through so many redesigns and changes we've completely lost track of when we last knew our way around. Getting rid of Flickr Pro, back in mid-2013, was a particularly dark moment – although it meant even free users got a better service, with more hosting space and better file size limits, it also meant you'd have to shell out a whopping \$50 to hide adverts.

Still, though, if you want somewhere to show off your photography online, Flickr remains one of the biggest and best sites for doing so. More professional looking than Facebook but still pretty user friendly, the most recent changes have made Flickr albums more attractive than ever. So is it time to reevaluate our irrational anti-Flickr bias? Let's take a look...

Huh? Registration Dramas

To use Flickr, you need a Yahoo ID, which means if you don't already have one, you'll need to sign up for a Yahoo email address and account. According to Yahoo, that's because it's 'streamlining' the process – and the whole thing is really for your benefit, because it lets you log into all of Yahoo's services with one username and password.

That's fine if you're a Yahoo user, but if you've never had a Yahoo account, it's an extra thing you have to remember. Of course, all the good Yahoo usernames are long gone, so you'll end up with something completely unlike your real name or any other login you use, probably with numbers on the end.

Fix it: Sorry, we've got nothing. For a while there, even once Yahoo had bought Flickr, it let users sign in with Facebook or Google logins, but as of last summer, only a Yahoo login will do. Bah!

Argh! How Do You Delete?!?

Bit of a weird complaint, but anyone who ever uploads anything to the internet is likely to want to delete things at a later date. If you've had a Flickr account since the beginning, even if you only used it intermittently, there's bound

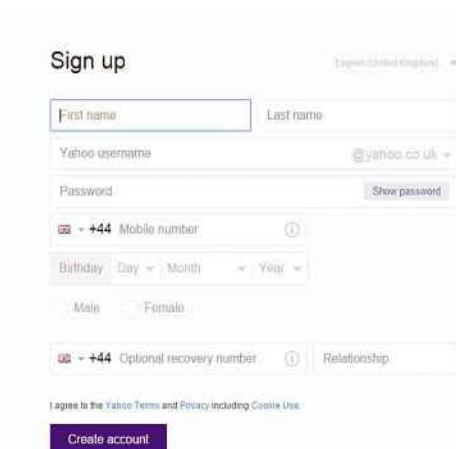
to be some stuff you're not so keen on. So where's the delete button? It's nowhere immediately obvious. If you've accidentally uploaded something you'd rather wasn't available for the whole world to gawk at, it can take an embarrassingly long time to find the delete options.

Fix it: To delete a picture, open it up, hover over the Edit icon, and you'll get the option to delete it. Phew. To get rid of a whole album, you'll similarly need to open it and click edit, then a tiny 'Delete this album' option will appear.

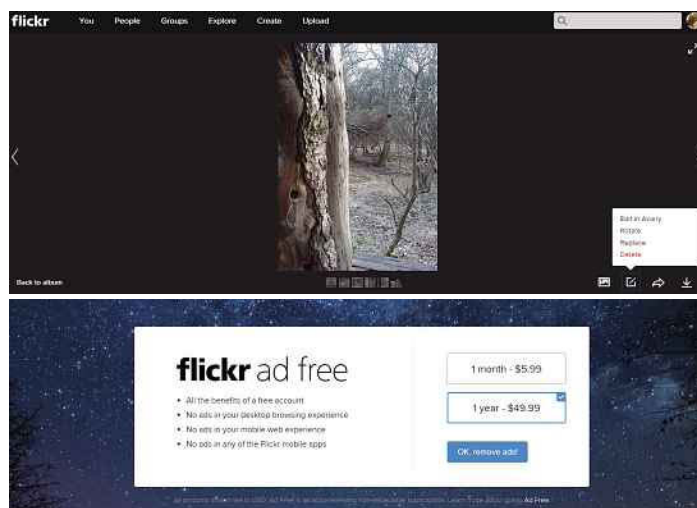
Bah, Humbug: Everything Changes

At the end of the day, Flickr seems to be in a tough position at the moment. It's got users complaining about things, but when those things are fixed, more complaints come rolling in. Maybe it's just that people hate change. Flickr has been around a long time, so many of its users have become well and truly used to how things work, and resent changes. Even if those changes might be for the better. Sorry, Flickr, it's not always you – sometimes it's us.

Fix it: Take a deep breath. It'll be okay. **mm**



The screenshot shows the Flickr 'Sign up' page. It features a 'Sign up' header with a link for 'Sign in (Yahoo! UK/US only)'. The form includes fields for 'First name', 'Last name', 'Yahoo username', 'Password' (with a 'Show password' toggle), '+44 Mobile number', 'Birthday' (with dropdowns for Day, Month, and Year), 'Male' and 'Female' radio buttons, '+44 Optional recovery number', and 'Relationship'. At the bottom, there is a checkbox for 'I agree to the Yahoo Terms and Privacy including Cookie Use' and a 'Create account' button.



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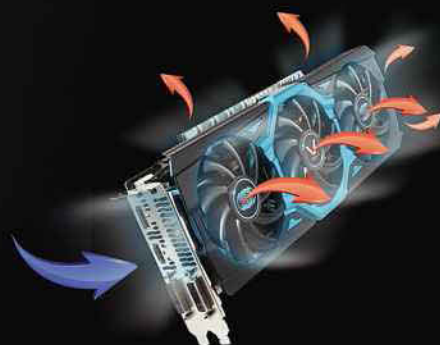
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